Vol. LIII
RARY OF CONGRESS
NAUTICS DIVISION

JANUARY 15th, 1948

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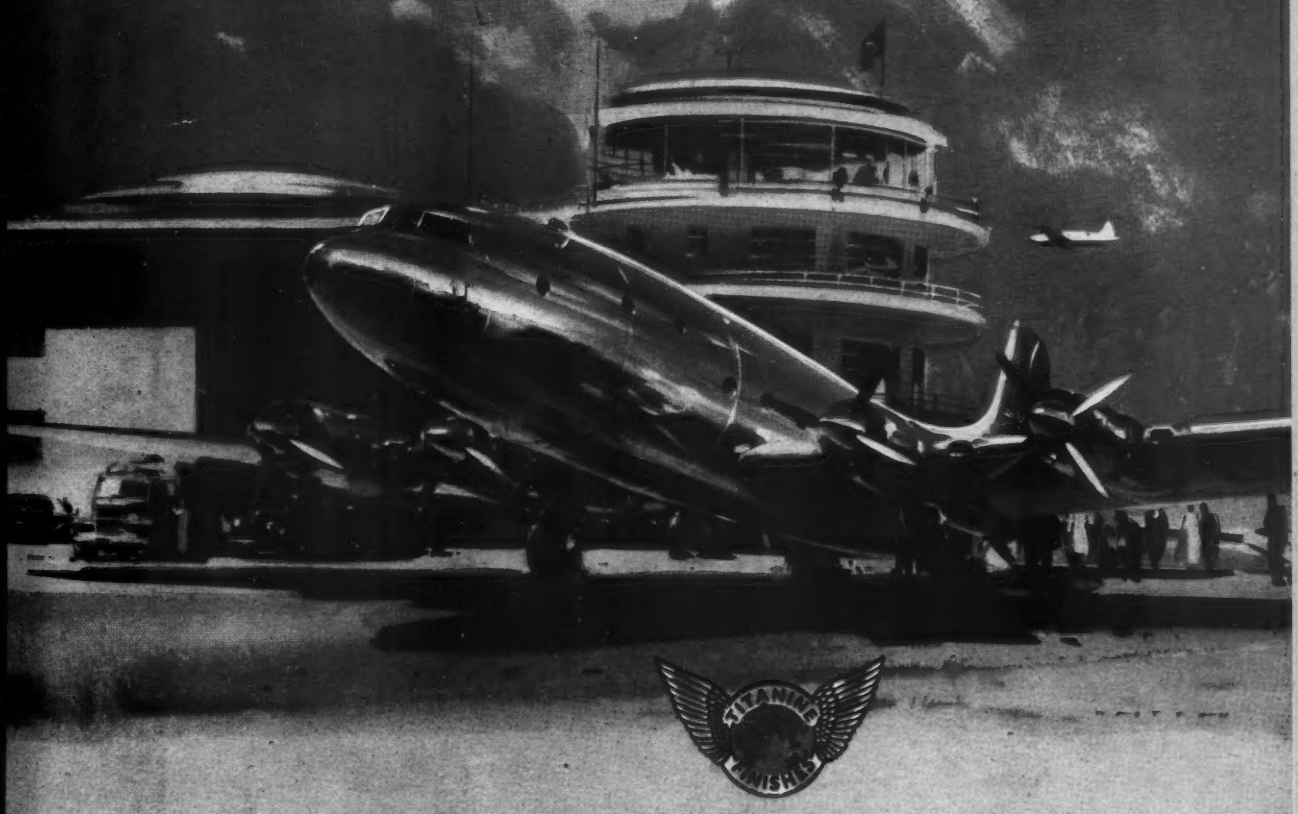

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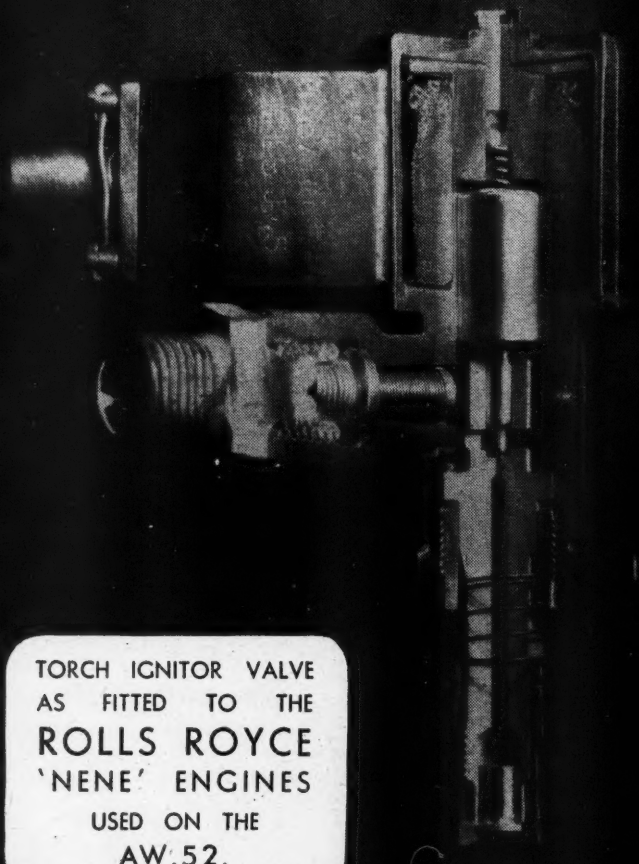

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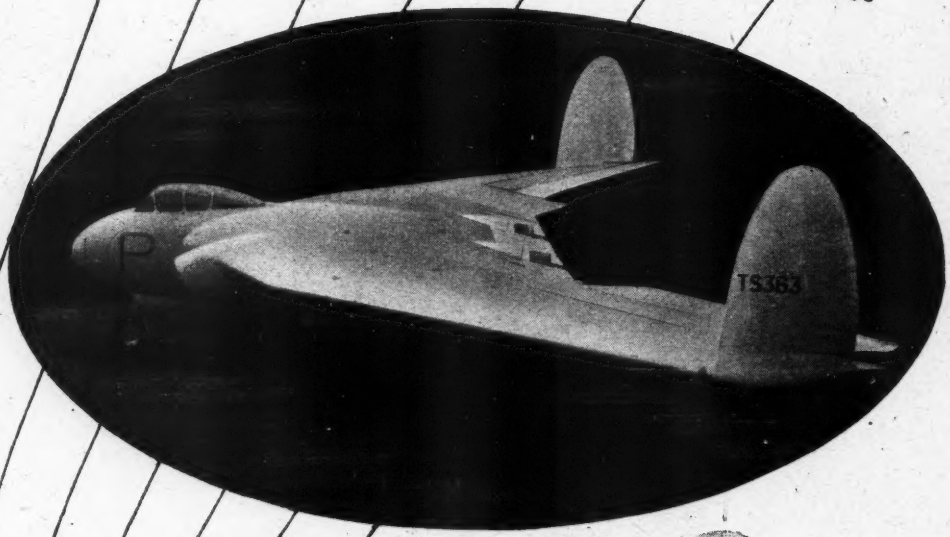

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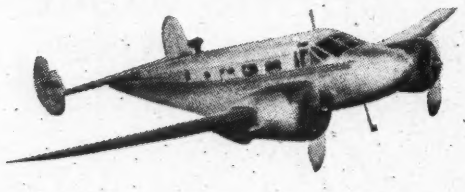

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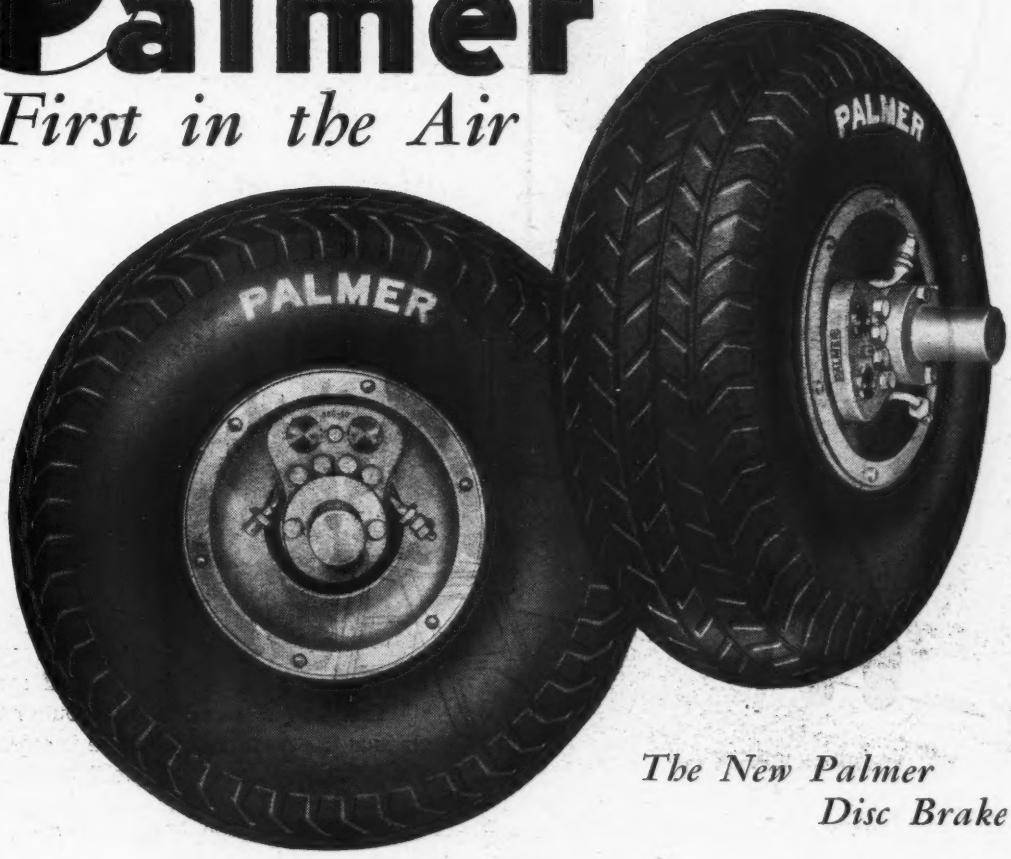

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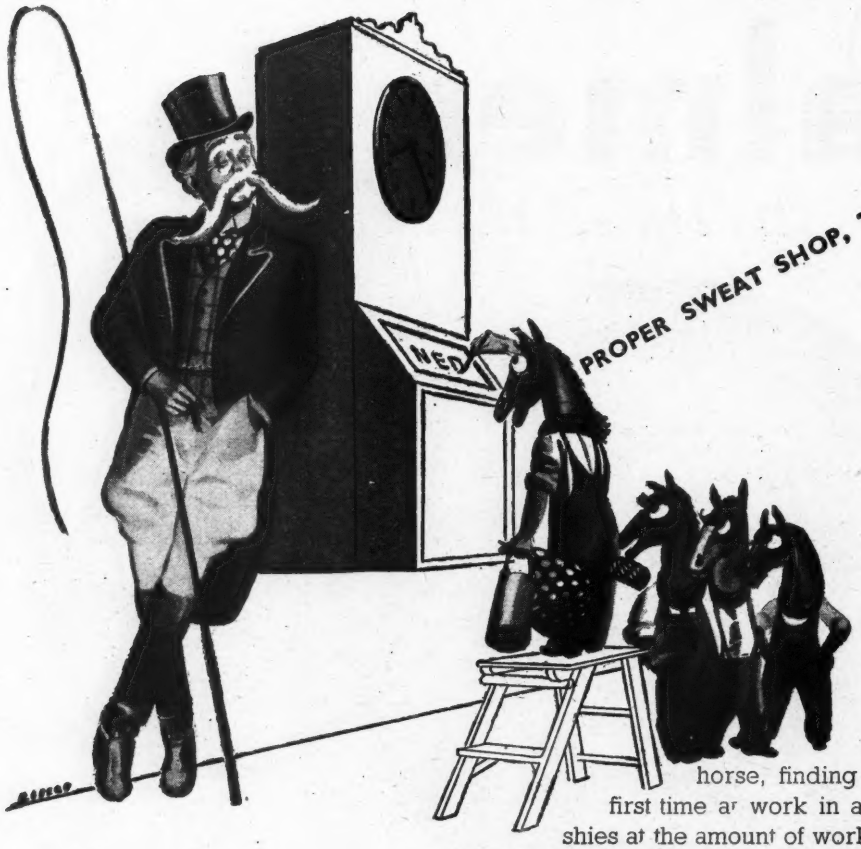

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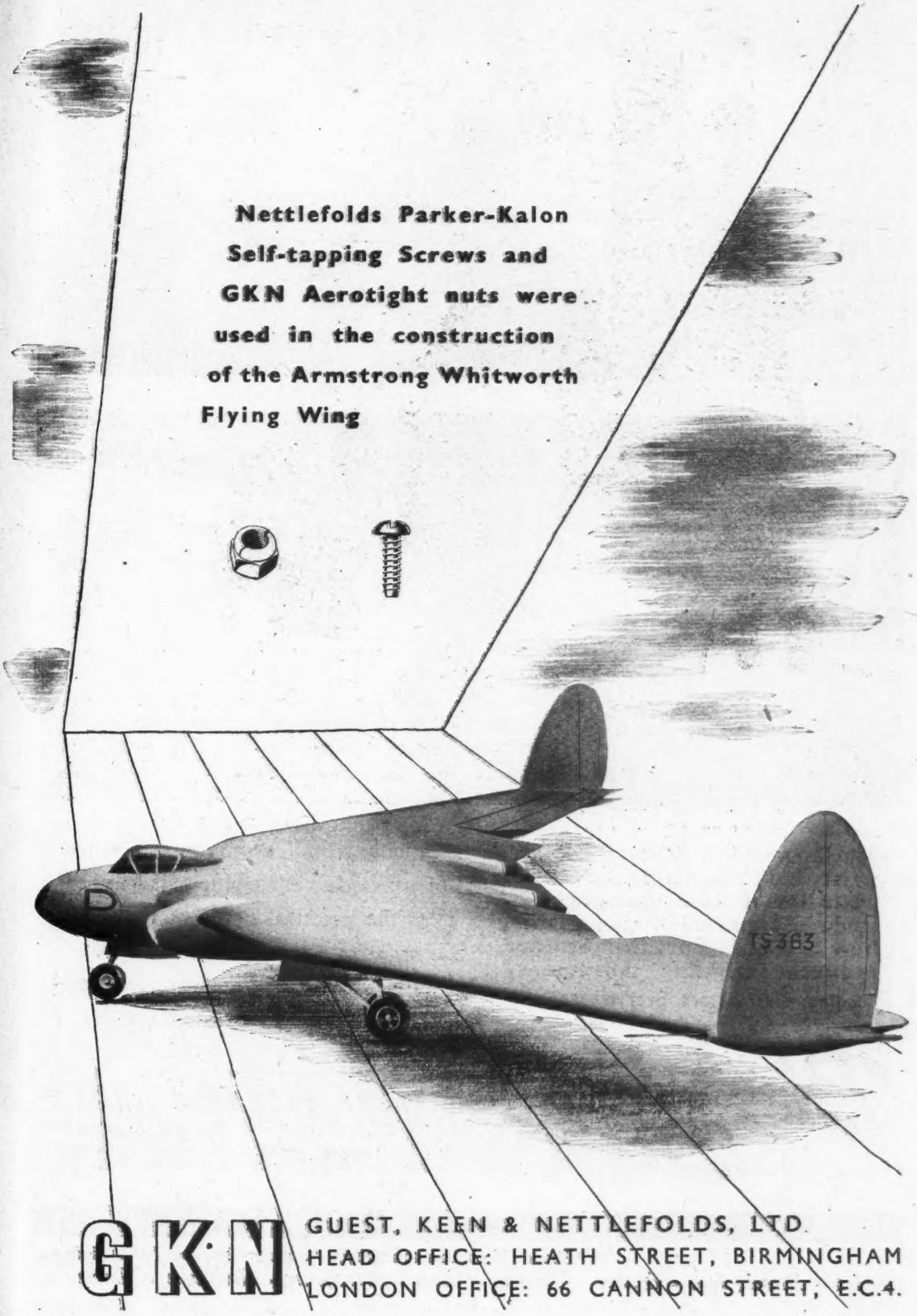

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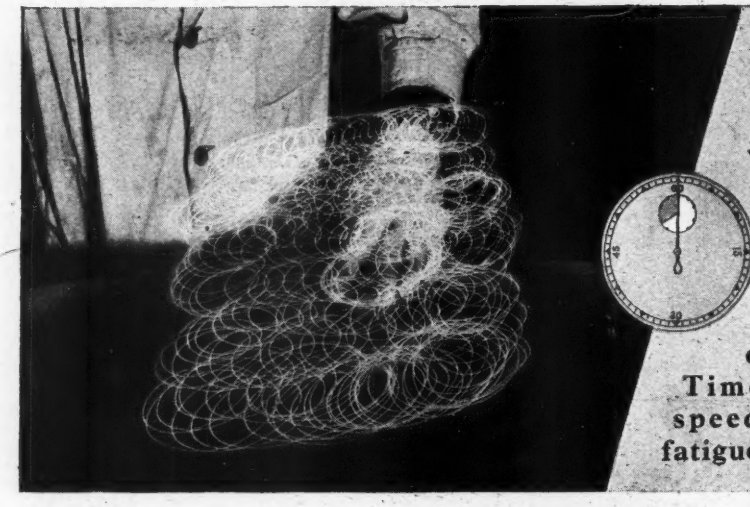

20 mins.

When waterproof emery paper is used for an area of similar size, the intricate light pattern reveals wasteful expenditure of time and energy. Time 20 minutes, and speed likely to fall as fatigue increases.

The lamp on our Research Engineer's wrist was responsible for the fine white lines in these photographs. A study in Time and Motion, showing how a B & D Portable Sander reduces fatiguing movement.

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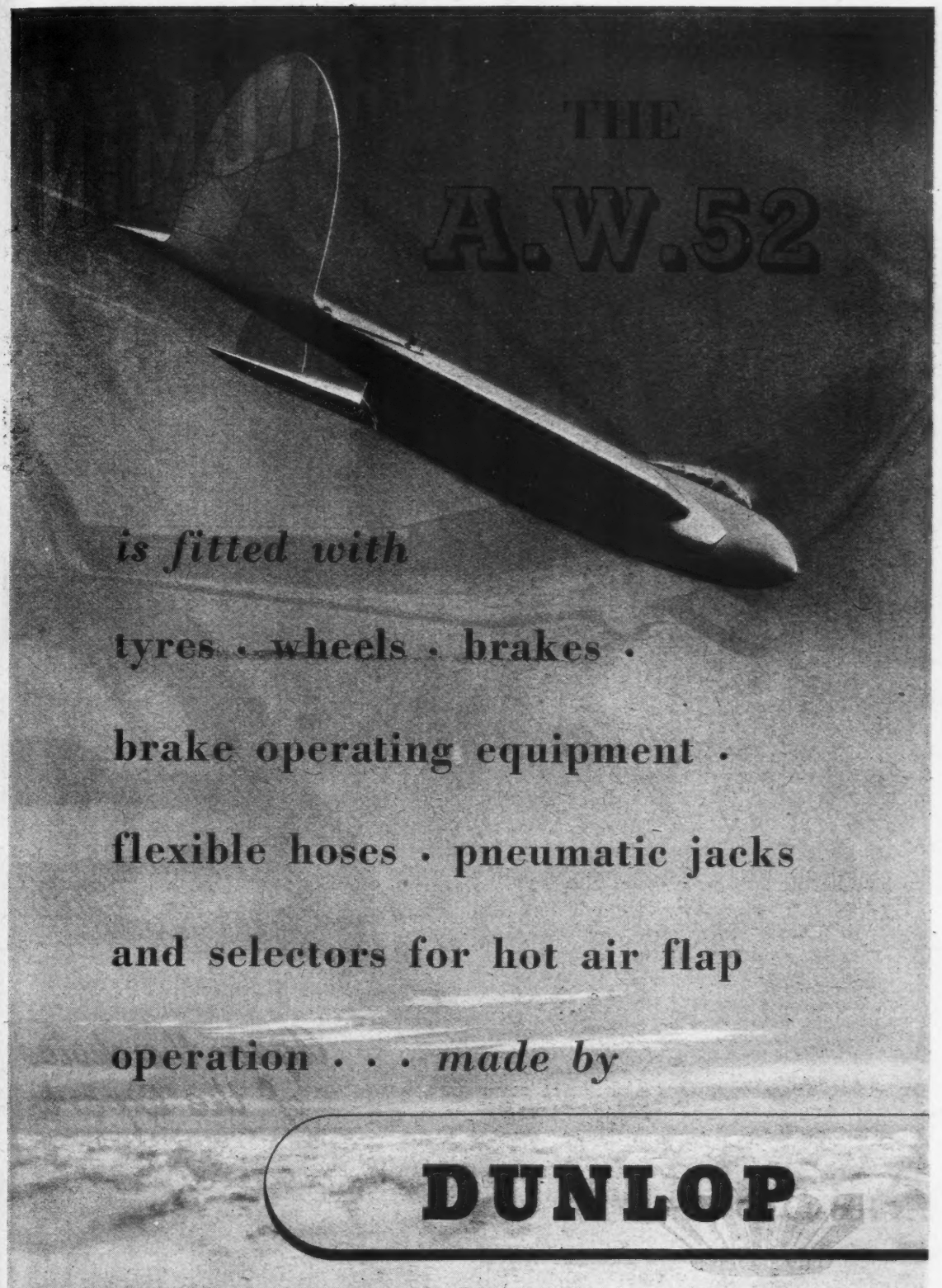

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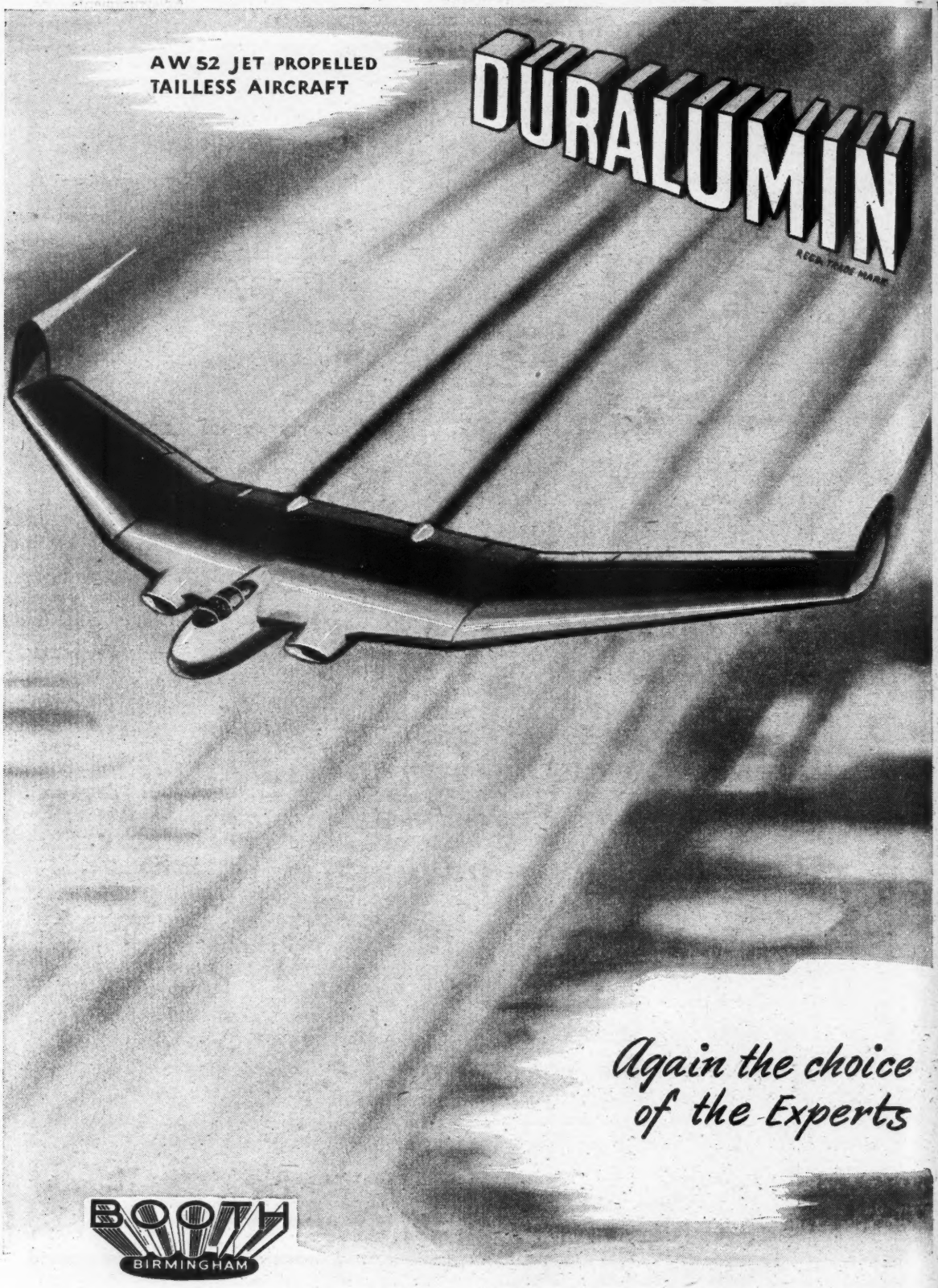

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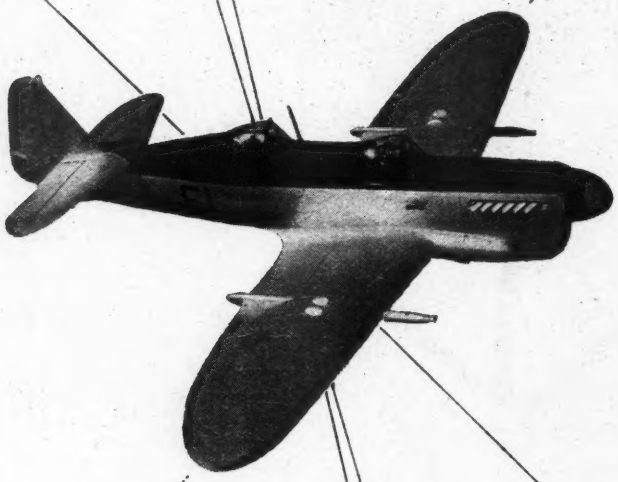

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The Outlook

Another £8 Million Gone

THERE are few surprises in the annual report and statement of accounts of the British Overseas Airways Corporation issued last week. The gross amount of the losses is just about what had been expected, and the main reason given in the report, in fact given more than once (presumably to lend emphasis to it in the tradition of the late Lord Northcliffe's dictum that "reiteration is the soul of journalism) is "the multiplicity of uneconomical aircraft which the Corporation had to use." It is further added that "the outstanding fact is that with the present types of aircraft even with a high load factor, receipts barely covered direct operating costs. On many routes little or no contribution was made to the indirect costs and overheads, and consequently increased services merely meant an increased deficit." It is indeed, as "Peterborough" said in the *Daily Telegraph*, "a moving thought that we should have been in pocket if all the passengers travelling by air had been paid £50 not to go."

Next in the table of reasons for the heavy losses, and therefore, presumably, regarded as the second most important factor, comes "the delay in the delivery of the Tudors and the consequent changes of plans, with their financial repercussions." The Tudor I position cannot be judged until the Courtney report is published, if it ever is, but it is encouraging to read the statement that "the Tudor II would, on the basis of its specification, have given a better financial return than the aircraft of smaller capacity which had to be flown on the Empire routes."

On the whole, the report is not too unkind to flying boats. It does bemoan the fact that the provision of marine airports and accommodation for passengers at night stops on the flying-boat services have involved the Corporation in a cost of £1,150,000 a year, but it concedes that "the flying-boat services are popular with the public because of their comfort." There appears to be a slight inconsistency in that on one page it is stated that the night stops reduce the utilization of the aircraft, but on the next page one finds the following statement: "the Hythe flying boats operating from a pre-war civil base have achieved on long Empire routes and despite their slow schedule and night stops a utilization of some 2,100 hours per aircraft." We would submit that such a figure is extremely creditable, and that it appears to show that the flying boat is not such a bad aircraft after all. Moreover, on direct maintenance the number of manpower hours per flying hour was only 4.5 which is probably better than any achieved by the other aircraft types operated by the Corporation.

In fact, the only valid argument against the flying boat seems to be that the Corporation has to provide the marine airports instead of merely paying landing fees at land airports. This is reasonable enough from the Corporation's point of view, but from that of the taxpayer it would appear to matter little whether he pays for the Corporation's marine airports or foots the bill for land airport facilities which do not begin to be covered by the landing fees and rents charged, high as they are. In the wider aspect, the nation should realize that it is not merely the £10 million lost by the two Corporations which come out of the taxpayer's pocket. To that figure must be added the untold millions sunk in airports if one wants to know what air transport is really costing.

The Dilemma

IDEALLY an aircraft fleet involving not more than three or four different types would no doubt be an economy compared with the heterogeneous collection which B.O.A.C. has hitherto had to operate. But one does wonder whether this aspect has not been overstressed in the report, and in a letter to *The Times* from Major R. H. Thornton. B.O.A.C. is much in favour of American aircraft, and its Constellations have reached

JAN 15 1948

the equivalent utilization of 3,000 hours per annum, a figure which is almost frightening.

In this connection it is well not to overlook the fact that, as we mentioned last week, many American operators are heavily "in the red." Yet they are using modern aircraft types designed specifically for air transport. Moreover, the United States is, geographically, an almost ideal country, with its long distances, uniformity of legislation and absence within the country of Customs and other barriers.

The multiplicity of types in use by B.O.A.C. is another source of expense, but it might be thought that the Lancastrians could have been dispensed with and the services operated entirely by Yorks. The Lodestars could, one would imagine, have been replaced by Dakotas; and when non-delivery of Tudor IIs compelled the ordering of substitutes, why could not an existing type have been added to instead of ordering the Haltons, with which the Corporation appears to be so dissatisfied? In that way the number of types would have been kept down a good deal.

What the Government now has to decide, and it is a dilemma of some magnitude, is whether to go on losing sterling until the new British types come along, or to buy a few more American machines with dollars. The problem is made the more difficult by the need for keeping the British aircraft industry going, an aspect which does not directly concern B.O.A.C. very much, but which does vitally affect the national security. Not only is it impossible to improvise such an industry in an emergency, but it is important that the British manufacturer obtains the results of operational experience of his types.

As a compromise, and by way of an interim measure, it seems worth considering the purchase of a number of D.C.4Ms. This type has already done good work over the Atlantic, the airframes are available for fairly quick delivery and can be paid for in Canadian dollars, while the Merlin engines can, of course, be paid for in sterling.

The number of Yorks, Lancastrians, Liberators and Haltons in service at present represent a total of some 60 aircraft. For an operational period of something like $3\frac{1}{2}$ years, presumably an equivalent number of interim types would be needed. If the D.C.4M were chosen, the situation at the end of about five years would be that B.O.A.C. would be operating a fleet of D.C.4Ms, some Dakotas, Constellations, Stratocruisers and Hermes, a total reduction to five types. After that, there could be a change from D.C.4M to the M.R.E.

If the Tudor II can be brought into service on the Empire routes—and, be it remembered, it has not been abandoned officially—this would save further dollar expenditure of any kind. From every point of view that would be preferable, but the whole Tudor situation is at present a problem in itself.

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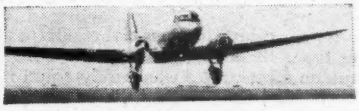
"Flight" photograph.

***PIONEER TRAIL:** Only the hot effluxes from its twin Rolls-Royce Nene turbo-jets relieved the wintriness of the scene as the A.W.52 research aircraft, a progress report on which appears in this issue, "sat" for John Yoxall near Baginton recently.*

B.O.A.C. REPORT

Activities of the Corporation and Review of Operating Conditions with a Statement of Accounts for the Year 1946/1947

THE long-awaited annual report and statement of accounts of the British Overseas Airways Corporation for the year which ended on March 31st, 1947, was published last week with a clear and frank exposition of the conditions which had contributed to a large deficit. During the past few months forecasts of heavy losses have been made, since it was common knowledge that the Corporation had been operating under extreme difficulties. Many of the forecasts have proved to be correct, and the statement shows a deficit of £8,076,844. The report gives an account of the main activities of the Corporation during the year, including the adjustments which were made for the transition from war conditions to peacetime operation, the replacement at overseas stations of the services previously provided by the R.A.F., the opening of new routes, and a summary of the close association with Commonwealth partners. In dealing with the activities of B.O.A.C., the report states that it was considered to be the Corporation's first duty during the year, as in the war years, to expand and develop essential air services along the main trunk routes of the Commonwealth and across the North Atlantic together with many local services—notably in the Middle East.



Douglas Dakota.

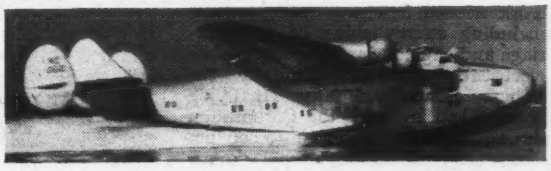
Some services were operated not because they were commercially attractive, but because they were required for reasons of Government policy, and instructions were received by the Corporation early in the year to expand services in order to help demobilization in R.A.F. Transport Command. The extent of expansion is shown by the mileage increase from 33,465 in 1940 to 49,585 in 1945/46 and 53,998 in 1946/47. At a number of points along the routes R.A.F. staging posts and facilities had to be taken over, since the converted military types of aircraft used and the lack of night-flying facilities at many places made it necessary to retain a large number of landing stages. On March 31st, 1947, B.O.A.C. staff were employed at 472 overseas bases and stations to organize passenger operations, maintenance and medical services, and additional signals facilities. During the year increasing assistance was given to the development of Commonwealth airlines in the form of advice, guidance, and in some cases seconding of trained staff to local companies. Such companies, the report states, are building up a network of local services which will feed the trunk routes and will serve as agents in their areas to the advantage of all. The Corporation's scope, therefore, could not be measured solely in the terms of the extension of routes, the opening of new services, or ton-miles flown.

Consolidated Liberator.

Avro Lancastrian.

Apart from services rendered to companies overseas and British charter companies in the handling of passengers and aircraft in stations along the routes, the Corporation maintained a high standard of safety.

During the early part of 1947 the wartime organization of five Regions was gradually superseded by a new organization consisting of three Divisions: the Atlantic, the African and Middle Eastern, and the Eastern Division. The change was made to simplify control of operations and administration, by delegating responsibility for the execution of services over the entire length of routes in each of the three geographical areas, to a single home-based organization, with the exception of the Atlantic Division. The latter Division established headquarters at Dorval since no suitable base was available in the U.K. The importance of a well-equipped base for efficient and economical operation was emphasized, and it was pointed out that, in spite of the Constellations being grounded for modifications at one period, the five aircraft reached a service utilization of more



Boeing (314A) Clipper.

SUMMARY OF OPERATING ACCOUNT SHOWING SCHEDULED AND OTHER SERVICES

1945/46		Scheduled Services	Other than Scheduled Services	Total
£	REVENUE	£	£	£
6,173,955	Traffic revenue ...	11,316,359	143,175	11,459,734
26,392	Incidental revenue ...	87,779	—	87,779
£6,200,347		£11,404,338	£143,175	£11,547,513
	EXPENDITURE			
49,118	Aircraft standing charges.	2,154,160	25,339	2,179,499
3,755,867	Aircraft maintenance and overhaul.	4,993,588	56,194	5,049,782
2,355,083	Flying operations ...	3,183,139	34,826	3,217,965
151,286	Charter of aircraft and crews.	319,424	2,375	321,799
676,280	Passenger service ...	658,591	3,775	662,366
1,855,642	Station costs	2,730,781	5,460	2,736,241
113,161	Sales and publicity ...	407,356	—	407,356
1,507,580	Divisional administration.	1,617,766	1,295	1,619,061
261,723	Technical training ...	1,035,009	—	1,035,009
	Central supplies organization.	263,615	—	263,615
839,808	Head Office administration and general services.	1,311,960	1,050	1,313,010
£11,565,548		£18,675,389	£130,314	£18,805,703
	SURPLUS	—	£12,861	—
	DEFICIENCY	£7,271,051	—	—
£5,365,201	NET DEFICIENCY carried to Surplus and Deficiency Account.			£7,258,190

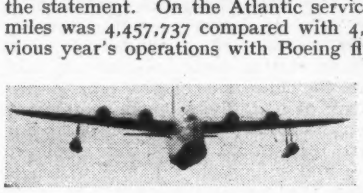
Direct operating costs have been allocated to other than scheduled services on the basis of the appropriate aircraft type costs. The allocation of the remaining items of expenditure has been based on assessments of the proportions under each heading deemed to be appropriately chargeable to such services.

B.O.A.C. Report . . . . .

than eight services a week, and more than eight hours per day per aircraft. But for the acquisition of the Constellations and their introduction into service by July 1st, it is claimed that British commercial services across the North Atlantic would have ceased in the autumn of 1946.

Traffic

In the year 1945/46 traffic reached a wartime peak consisting largely of military loads, and 1946/47 saw a rapid change in its nature and flow. There was a sharp decline in traffic from the U.K. to the East, and on the U.K.-India-Malaya service alone there was a drop of over 11,500,000 capacity ton-miles (tons available x distance flown) compared with the previous year. This was more than balanced by the increased capacity offered on the Australian and South African routes, but as those were shared with Q.E.A. and S.A.A., half the capacity offered, or nearly 12,000,000 capacity ton-miles does not appear in the statement. On the Atlantic service total capacity ton-miles was 4,457,737 compared with 4,093,932 for the previous year's operations with Boeing flying-boats, although the Constellation service operated little more than six months of the year. Early preparations were made for the time when aircraft would no longer be filled by Government priority traffic, but the relaxation of Government control was less rapid than had been expected, and at the end of the year most services were still subject to some degree of priority control.

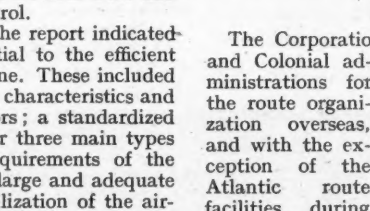


Short Hythe.

In a review of operating conditions, the report indicated certain requirements which were essential to the efficient and economical operation of a civil airline. These included the operation of aircraft with economical characteristics and competitive with those of other operators; a standardized fleet of aircraft of not more than two or three main types suited to the operating and traffic requirements of the routes; a network of routes sufficiently large and adequate in traffic potentials to permit a high utilization of the aircraft; a well-developed route organization; a high standard of aircraft maintenance and well-equipped maintenance bases, a high standard of aircrew and ground crew training.

Aircraft

The B.O.A.C. position with regard to the essentials previously mentioned was dealt with in some detail. At the beginning of the year the fleet strength was 207, and the main operating fleet comprised nine different types. At the end of the year, although the fleet had been reduced to 175 aircraft, there had been no reduction in types. With the exception of the Constellations, the majority of aircraft were obsolescent and nearly all military conversions. They were of relatively small capacity, needing a large number of aircrews, and with the limitations imposed by the length of stages on the Corporation's routes, payloads were small in contrast with operating costs. The number of different types made planning of operations and the training of air and ground crews complex and costly. In addition, a large assortment of spares at bases and along the routes was necessary, and a large number of accounting, administrative and maintenance staff were required. At the outset the York needed extensive modifications, including strengthening of undercarriage and engine bearers, and complete electrical re-wiring. Similarly the military Sunderland Mark III flying boats taken over by the Corporation during the war cost some £6,000 per aircraft to convert, and the Dakotas, all of which were of military type, cost about £5,000 per aircraft and took about three months to convert for civil operation. To fill the gap of between twelve and fourteen months before the postponed introduction of the Tudor II, the Corporation agreed to use 12 Halton aircraft, and delivery was stipulated for May and June, 1946. The first six aircraft were delivered without de-icing equipment and spares were not forthcoming. At Bovington, the base provided for those aircraft, the hangars were unheated and there was no living accommodation at the station. A limited service was started in September, 1946, but after six weeks the aircraft were grounded for failures in the hydraulic system. They were returned to the manufacturers for de-icing equipment to be fitted and did not operate again in the year under review. Meanwhile the base, with approximately 400 on the staff, was maintained for nearly twelve months at a cost of £193,120 to produce approximately 1,000 hours of aircraft utilization.



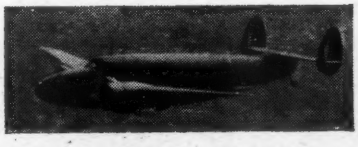
Avro York.

Handley Page Halton.

The outstanding factor affecting the financial results was that with the existing types of aircraft, even with a high load factor, the revenue on most routes was barely equal to the direct operating costs, and thus made little or no contribution to the indirect operating costs, such as station charges and route administration. The deficit, therefore, grew with increased services. Since B.O.A.C. was the only major user of flying boats, marine airports and passenger accommodation had to be provided, and while the flying-boat services were popular with the public because of their comfort, their use involved the Corporation in a cost of £1,500,000 per year.

Route Organization

The Corporation is dependent upon foreign, Dominion and Colonial administrations for the route organization overseas, and with the exception of the Atlantic route facilities during the year were far below minimum requirements. The result was considerable difficulty in adhering to schedules and also in reduced aircraft utilization, in payload and in restriction of the type of aircraft which could be used. Demobilization of the R.A.F. also restricted route facilities on the North African coast to daylight hours only, and the Dakota service between the U.K. and the Middle East, which had previously operated direct with refuelling stops only, had to be operated on a slow schedule with a night stop each way. At the end of the year there were few buildings available at the airfields designated for civil use and maintenance had to be carried on either in the open air or in hangars and workshops which were for the most part unheated and widely dispersed. Although London Airport was opened for operations in May, 1946, there were no hangars or workshops, and land planes based in the U.K. had to be maintained elsewhere—Lancastrians and Yorks at Hurn, Dakotas at Whitchurch, and Haltons at Bovington. In order to ensure that aircraft would be in position for scheduled departures, it was often necessary to fly them to the airport the evening before departure, resulting in reduced utilization and higher costs of flying crews. During the year the Corporation was obliged to use eight maintenance bases. The Hythe flying boats, on the other hand, operating from a pre-war civil base, despite a slow schedule and night stops, achieved utilization of some 2,100 hours per year per air-



Lockheed Lodestar.

craft coupled with a figure of 4.5 manpower hours per flying hour on direct maintenance. Yorks, however, attained only 1,350 hours utilization with a maintenance figure of 10 manpower hours.

Staff

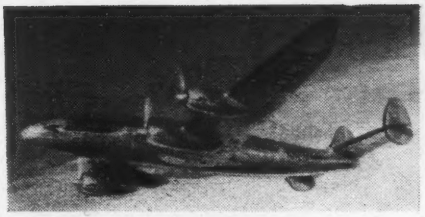
On March 31st, 1947, the number of employees was 24,464, an increase of 1,515 during the year. Of that total, British contract staff represented 1,236 overseas and 1,536 in the U.K.; the remainder, numbering 21,692, were engaged locally and 30 per cent of them were nationals of the country in which they were employed, mainly on low-category tasks. A considerable number of the staff were engaged in work for other operators, and a case in point was at the Central Training School where all the staff were on the strength of B.O.A.C., whereas only 55 per cent of those trained there were, in fact, for the Corporation's service.

A Technical Development Department was established which included a Project Branch, to deal with new aircraft and equipment from the specification, design and development stages to the construction of prototypes; and a Development Flight, whose function was to test new aircraft or equipment before going into service. Many tests were made by the Development Flight at the request of the M.O.S. and M.C.A.

Training presented another problem, since some of those R.A.F. pilots who had been seconded to B.O.A.C. during the war returned to peacetime occupations, and others were unsuitable, owing to age or for other reasons, for employment in the Corporation, so that fresh aircrew had to be recruited and trained. The same applied to ground engineers. In March, 1946, a Central Training School was opened at Aldermaston, and a total of 847 aircrew were trained during the year.

Statement of Account

In the operating account, the deficit for the year on the scheduled services amounted to £7,271,051, while a profit of £12,861 was made on non-scheduled services resulting in a net operating deficit of £7,258,190. The balance of the deficiency was made up by standing charges. Traffic revenue amounted to £11,459,734. The average rate earned for mail during the year was 211d per load ton-mile, whereas



Lockheed Constellation.

the rate for 1946/1947 had dropped to 136d per load per ton-mile. Mail revenue amounted to £3,403,225. The total expenditure for the year was £18,805,703, and the primary cause of the high rate was the necessity of operating a number of uneconomic types of aircraft from a number of widely dispersed and improvised maintenance bases. Plans prepared by the Corporation for the period under review involved a considerable increase in operations, based largely on the Tudor I and Tudor II. Consequently, ground organization, staff and equipment were expanded, and the plans' postponement involved the Corporation in serious unproductive expenditure and increased overheads. New plans had to be drawn up which had to be changed from time to time owing to delays in the delivery of other aircraft. During the year the Corporation had no control over prices charged for most supplies of aircraft and engines and engine spares, or for much overhaul work carried out under contract, as control in these respects was exercised by the M.O.S. and the M.C.A.

Conclusion

In conclusion, Sir Harold Hartley in the report stated that the standards of safety, regularity and passenger service on the routes, which had earned the freely expressed satisfaction of the public, could only have been accomplished under existing conditions at a heavy cost, and he summarized the main causes of the deficit as being briefly due to the multiplicity of types of uneconomical aircraft which the Corporation had to use; the delay in the delivery of Tudors and the consequent changes of plans with their financial repercussions; the scattered and improvised maintenance bases which the Corporation had to use; the deficiences in route organization; the development work carried out by the Corporation during the year; and the programme of services in which commercial considerations were often subordinate to the national interest. All these causes contributed to the losses, but the outstanding fact was that with the present types of aircraft, even with a high load factor, receipts barely covered direct operating costs, and there was only one conclusion: heavy deficits would inevitably continue until the Corporation had the aircraft and the facilities to make it self-supporting in a highly competitive international business.

R. A. BRUCE

OLDER members of the British aviation world will learn with regret of the sudden death from heart failure on January 9th, at the age of 78, of Mr. R. A. Bruce, former managing director of the Westland Aircraft Works at Yeovil.

Mr. R. A. Bruce.

Robert Arthur Bruce, O.B.E., M.A., M.I.C.E., F.R.Ae.S., played a leading part in building up the Westland aircraft organization. A Bristolian by birth, he was educated at Clifton and Cambridge, and after a short period with Brennan on monorail work he joined the British and Colonial Aeroplane Company, as it then was, under Mr. Coanda, who was at that time Bristol's chief designer. Afterwards he became aircraft consultant to the Greek Government, and in the first world war he became Admiralty inspector to the Sopwith Aviation Co.

When Petters, Ltd., decided to start an aviation branch, Mr. Bruce was appointed to take control and under his guidance the aircraft works grew to large proportions. Many types of military, civil and research aircraft, some of them highly original, were produced under Mr. Bruce's leadership. Many of those who worked under Mr. Bruce in the early days are still with Westland Aircraft, Ltd., including Mr. Arthur Davenport, now technical director of the firm.

Mr. Bruce retired from management in 1934 but continued for some time as a consultant. He paid what proved to be his last visit to the Westland works less than a month before his death.

REX PIERSON

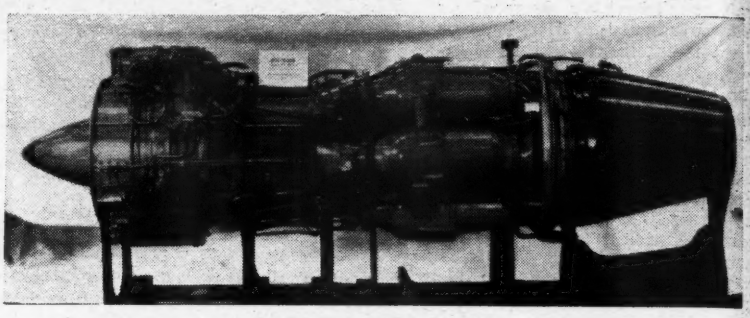
WITH the death at the early age of 57 of Mr. "Rex" Pierson, British aviation has lost one of its pioneers, and one who not only spent his whole working life in aviation but spent it in the service of one firm. Reginald Kirshaw Pierson, C.B.E., became apprenticed to the Vickers works at Erith in 1908, and when the aviation section was formed in 1911, with Major Wood at its head Rex Pierson joined it. While working on design he also found time to learn to fly and obtained his "ticket" in 1913.

Mr. R. K. Pierson.

By hard work and ability Pierson rose to become chief designer in 1917, and from then on was responsible for a long range of aircraft of widely varying type. We have no room to list here all the machines for which he was responsible, but they included landplanes and amphibians, biplanes and monoplanes. Among those which won fame were the Vimy, on which Alcock and Brown made the first direct flight across the Atlantic in 1919, the Wellesley which established a world's non-stop record of more than 7,000 miles, and the Wellington bomber which did such excellent work in the second world war. The two latter incorporated the geodetic principle of construction introduced by Mr. B. N. Wallis.

We on *Flight* knew Rex Pierson from the early days, and closely followed his work. With his death we have lost a very good friend.

HERE AND THERE



CHINOOK : An elaborate mock-up of the Avro Chinook turbo-jet, the first Canadian turbine unit for aircraft. With its nine-stage compressor and six combustion chambers it will have a 2-minute rating of 2,590 lb thrust at 10,100 r.p.m.

G.C.A. Training

INTENSIVE G.C.A. instruction and instrument flying practice is to be a part of the training of pilots flying for Airwork, Ltd., and in spite of demands upon the contract charter Division of the company, one of the Vikings has been allocated to this work.

Miles Aircraft Resignations

TWO Miles executives, Mr. D. L. Brown, A.M.I.C.E., A.M.I.Mech.E., A.F.R.Ae.S., and Mr. R. L. Robinson, have resigned. Mr. Brown was chief technical officer and personal assistant to Mr. G. H. Miles; Mr. Robinson was personal assistant to Mr. F. G. Miles and responsible for the Actuator, Co-Pilot, Philidas and Biro divisions of the company.

Shipwrights

THE Worshipful Company of Shipwrights, which now includes ships of the air as well as ships of the sea, reminds us that a number of copies are still available at 12s 6d of the book *Shipbuilding and Ships*, a volume containing the lectures and papers delivered at the recent Shipwrights' Exhibition. The proceeds of the sale of the book will be devoted to the charitable funds of the Company. Enquiries should be addressed to the Worshipful Company of Shipwrights, Baltic Exchange Chambers, 24, St. Mary Axe, London, E.C.3.

R.A.F. Film Producer

S/LDR. W. T. S. Williams, producer of *Target for To-night* and R.A.F. documentary films, died after an operation on Christmas day. He joined the R.N.A.S. in 1915 and retired shortly after producing the R.A.F. displays at the Wembley Tattoo in 1925. Returning to the R.A.F. in 1939, he took charge of all film activities at the Air Ministry, formed the R.A.F. Film Production Unit, and in 1940 wrote *The R.A.F. in Action*. He had recently been occupied in writing the official air history of the 1939-45 war.

I.A.S. Officers

Mr. J. K. Northrop.

JOHN K. NORTHROP, president of the Northrop Aircraft Corporation, whose Wilbur Wright Memorial Lecture to the Royal Aeronautical Society last year on "All-wing Aircraft" will be remembered, has been elected president for 1948 of the Institute of the Aeronautical Sciences, the American equivalent to our R.Ae.S. The honour thus shown Mr. Northrop will be warmly welcomed in British aeronautical circles.

News in Brief

As from January 1st, Mr. H. V. Gort, F.C.I.S., has been appointed managing director of General Aircraft, Ltd.

Mr. H. Drewitt has been appointed B.O.A.C. signals officer at Bangkok.

* * *

Dr. R. L. Smith-Rose, D.Sc., Ph.D., M.I.E.E., has been appointed director of radio research in the Department of Scientific and Industrial Research. He has been superintendent of the Radio Division of the National Physical Laboratory since 1939.

* * *

Mr. C. F. Russell has become chairman of the Aero Piston Ring, Ltd., and Mr. L. H. Maidman and Mr. L. P. Gibson, of Specialloid, Ltd., have joined the board of the Aero Piston Ring Co.

* * *

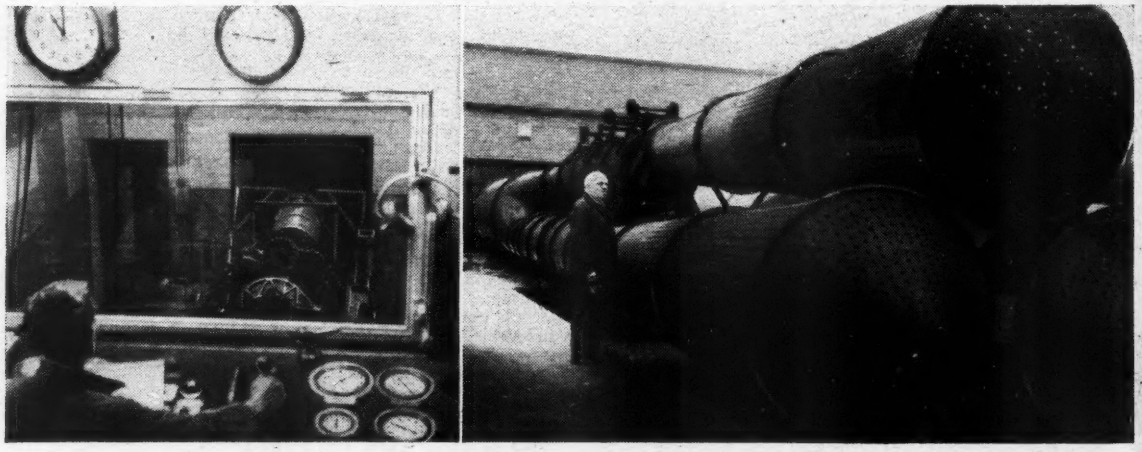
Mr. W. W. MacArthur, M.I.Mech.E., M.I.P.E., has left the Fairey Aviation Co. to become managing director of Air Ducts, Ltd., a Crittall subsidiary, and executive director of the Crittall factories in Glasgow.

* * *

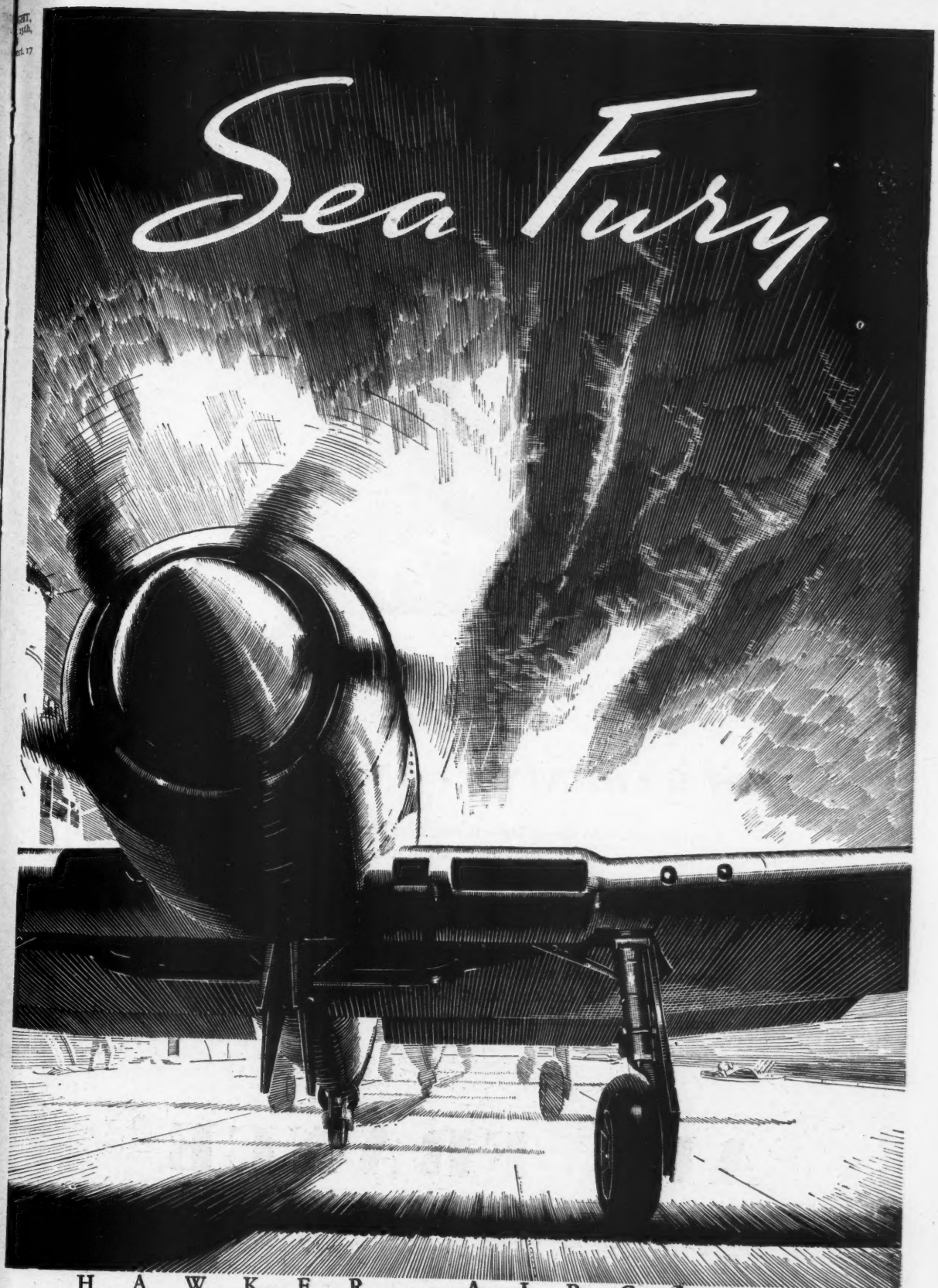
As from January 15th, aircraft approaching London Airport must signal to the control centre, the radio aid, such as I.L.S., S.B.A., etc., which they propose to use. M.C.A. Notice to Airmen, No. 3, 1948, gives details.

* * *

The Ministry of Supply has announced the appointment of Rear-Admiral M. S. Slattery, C.B., to the board of Short Bros. and Harland, Ltd., in February. A controlling interest in the firm is held by the Government.



TAKING OUT THE URGE : An exclusive "Flight" photograph of the new car-type silencers installed in the Rolls-Royce jet-engine test beds at Derby. They are 120ft long by 9ft high.



HAWKER AIRCRAFT
(Branch of Hawker Siddeley Aircraft Co. Ltd.)

FOUR CORNERS – ONE TICKET

Even aviators, who should know better, have been heard to refer to "The four corners of the earth" when attempting to convey a mental picture of vast distance. Air France, too, is closely associated with distance, because Air France proudly operates the most far reaching air network in the world under single control. This is a great boon to the air traveller who can now traverse three quarters of the globe with the maximum of comfort, the minimum of fuss and with but one ticket. Your travel agent will gladly provide you with detailed information.

London, Manchester, Glasgow to PARIS · RIVIERA · LISBON · SWITZERLAND · PRAGUE ROME · AFRICA · EGYPT · MIDDLE EAST · INDIA · HONG KONG · SHANGHAI · USA BUENOS AIRES · RIO DE JANEIRO · TRINIDAD

AIR FRANCE

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CIVIL AVIATION NEWS

"Flight" photograph.

CANADAIR IV: Trans-Canada Airlines have received from the manufacturers, Canadair Ltd., 15 North Stars, six of which were of the unpressurized type. Twenty of the fully pressurized aircraft have been ordered and deliveries are expected to be completed by the middle of this year. The Canadair IV (or DC-4M II) has been suggested as a suitable aircraft for B.O.A.C.

Airport Traffic Figures : Air Transport in Central Africa : A Good Year for K.L.M.

M.C.A. DIVISIONAL APPOINTMENTS

CONTROLLERS for the remaining two of the four Divisions into which the country has been divided by the M.C.A. for administrative purposes have been named. A.V-M. W. B. Callaway has been appointed Divisional Controller, South Western Division, and Captain (A) B. L. Huskisson, R.N., Divisional Controller of the Northern Division. The South Western headquarters will be at Bristol and that of the Northern Division will be at either Liverpool or Manchester.

These appointments, with those of Air Marshal Sir Roderick Carr as Controller of the London and South Eastern Division and A. Cdre. J. G. Murray, Controller of the Scottish Division, which have already been announced, complete the establishment of the organization.

B.A.C.A. WIDENS MEMBERSHIP

A NEW class of members, "affiliate members," embracing companies and individuals whose activities are ancillary to air transport, has been created by the British Air Charter Association. The annual subscription is £10. It is not intended for this new section to overlap or compete with existing bodies. The association's address is Londonderry House, 19, Park Lane, London, W.1.

FUEL RESERVE CALCULATIONS

THE unsatisfactory state of air-traffic control over Europe, the deficiency in navigational aids, blind-approach aids and good diversion airfields has made it necessary for the airlines and charter operators to introduce their own safety measures. The obvious and chief method has been to ensure that each aircraft should fly with a generous fuel reserve. In British European Airways, for calculating the amount of fuel required for any one route, the following considerations have been taken into account. Alternative airfields, known as "supplementaries," which would be available should the terminal airfield not be open were found and a comprehensive system of such airfields was made available for each route; the fuel required from "chocks away" at the departure airfield to "set course" from overhead, the fuel required from overhead at departure to overhead at the point of destination, taking into account direction and strength of prevailing wind, and the fuel required from overhead at the destination airfield to "engines off" after landing, were all calculated separately. The fuel required from destination to the farthest supplementary airfield was estimated and an additional allowance was made of 1½ hours' fuel, giving half an hour's allowance over destination, half an hour to land at the supplementary, and half an hour for inaccuracies in gauges and for balance in the tanks after landing. In short-distance aircraft such as the D.H. Rapide, only three-quarters of an hour reserve was allowed. It is found that on most occasions only a small portion of the reserve has to be used, which results, of course, in a loss of payload. B.E.A. has been striving to reduce the reserve in order that the best advantage could be taken of the payload capacity of the aircraft while still maintaining maximum safety and regularity. That is out of the hands of the Corporation, however, until efficient ground and air facilities are available on all B.E.A. routes.

The Rome-Marseilles route serves as an example of calculation.

Alternative airfields are Nice, Toulouse, Istres and Bordeaux, the latter being the farthest supplementary.

Rome-Marseilles	230 gallons.
Marseilles-Bordeaux	143 gallons.
Additional fuel allowance	135 gallons.
Total fuel in tanks	508 gallons.
Total reserve	278 gallons.

AIRPORT TRAFFIC

IN October, for the first time more passengers passed through London Airport than Northolt. The Heathrow figures for the month follow, with the corresponding Northolt figures in brackets: 32,189 passengers (30,521); 1,006 scheduled service arrivals and 1,017 departures (975 and 983); 549,049 lb of mail (148,317); 896,496 lb freight (582,145). In both cases, figures were higher than for September. Renfrew was the next busiest airport, with 7,951 passengers on scheduled services, followed by Nutts Corner with 7,079, Speke 6,185, Ronaldsway 3,997, Ringway 3,615, Prestwick 2,831, Southampton 2,608, Turnhouse 1,249, Poole 1,122, Croydon 839, Cardiff (Pengham Moors) 501, and Bristol (Whitchurch) 83. Croydon despatched the most charter flights at 821, and Weston led in private flying with 310 flights.

In November, London Airport again led Northolt with 26,693 passengers (18,419), 942 aircraft arrivals (732), 955 departures (746), 550,325 lb of mail (162,712), and 883,913 lb of freight (592,660). Renfrew was again third, with 4,469 scheduled service passengers. They were followed by Speke, Nutts Corner, Ringway, Ronaldsway, Prestwick, Eastleigh, Poole, Turnhouse and Croydon, in that order. Croydon had only 117 scheduled passengers, but again led in charter flights

Civil Aviation News . . . . .

with 477. Weston again was most used for private flights, with 238. If all flights are counted, scheduled, charter, test, private, etc., Aldermaston comes third to Heathrow and Northholt with 956.

K.L.M. CONSTELLATIONS TO USE TENGAH

CONSTELLATIONS operated by K.L.M. are to use the R.A.F. airfield at Tengah, the only airfield suitable for Constellation landings in Singapore. K.L.M. has been by-passing Singapore and flying direct from Bangkok to Batavia, but the company, which is shortly beginning a daily two-way service between Amsterdam and Batavia, requested 4 landings weekly at Tengah. Landings there are restricted by the R.A.F. to 8 weekly for all airlines, including Qantas, B.O.A.C. and K.L.M., and the latter has now been granted two landings in place of the four for which application was made. Qantas Constellations make six landings fortnightly. The decision on the K.L.M. allocation was made by the British Ministries of Air and of Civil Aviation.

WELSH ADVISORY COUNCIL

WHEN the newly formed Welsh Advisory Council for Civil Aviation met for the first time on January 7th at Cardiff, Mr. G. S. Lindgren, Parliamentary Secretary to the M.C.A., said that there were several reasons why Wales had been neglected with regard to civil aviation, and he believed that there had been no community of interest between North and South Wales. The council would provide an opportunity of disproving that theory, however; while the road communications were difficult and tedious, air transport overcame such barriers The Ministry and B.E.A. would now be in a much stronger position in dealing with Welsh matters. Mr. Kenneth Davies, as chairman, would become a member of the Minister's National Advisory Council, with direct access to the Minister himself. The members of the new council are:—

Kenneth Davies, chairman of the Finance Committee of the R.Ae.C.; J. B. Bennett, engineer and surveyor, Swansea B.C.; Councillor Huw T. Edwards, J.P., area sec., T.G.W.U.; D. R. Grenfell, C.B.E., J.P., M.P., chairman of the Welsh Parliamentary Party; Vernon Lawrence, O.B.E., clerk to the Monmouth C.C. and hon. sec. of the S. Wales Civil Aviation Committee; E. John Powell, M.Inst.C.E., engineer, surveyor and planning officer, Glamorgan C.C.; Alderman Tudor E. Watkins, M.P., hon. sec. Welsh Parliamentary Party; and two gentlemen both called William Jones. One is a C.B.E. and clerk to Denbigh C.C. and the other an O.B.E. and clerk to the Anglesey C.C.

IRANIAN SURVEY

MORE details are available of the Bristol Freighter fitted up for air survey work in Iran by Hunting Aerosurveys, and referred to in *Flight* on December 25th. It has an all-up weight of 37,000 lb, the equipment, crew and cargo weighing 6,075 lb. Two G.S.C cameras are carried, one in the nose and the other as a spare, and the one in use is heated by a modified Janitrol heater, for temperatures of minus 35 deg C are expected. and there is reserve heating available. Electrically heated suits and fur-lined suits are provided for the crews, also parachute and R.A.F. oxygen equipment, and navigational equipment includes a Sperry A.3 automatic pilot and a distance-reading gyro-magnetic compass. Use is made of the remaining large load capacity of the aircraft to carry, on the flight to Iran, considerable photographic material and spares; while on desert flights emergency supplies for the crew are to be carried.

NEW B.O.A.C. VICE-CHAIRMAN

SIR MILES THOMAS is to succeed Sir Harold Howitt as vice-chairman of B.O.A.C. when the latter, who is 60, retires on March 31st. Sir Miles has had a wide experience in engineering. He started as an apprentice at Birmingham. During the 1914-18 war he was in the Royal Flying Corps and the R.A.F., being at one time a flying instructor at Heliopolis. Demobilized in 1919, he became a writer on technical subjects and in 1924 joined Mr. William Morris, now Lord Nuffield, as sales adviser, becoming a director and sales manager and later vice-chairman and managing director of the Nuffield Group. During the 1939-45 war he was chairman of the Cruiser Tank Production Group and chairman of the British Tank Mission to the U.S.A. He is president of the Society of Motor Manufacturers and Traders and recently became a director of the Government's Colonial Development Corporation, an activity which he will combine with his B.O.A.C. interests.

Sir Miles Thomas.

Sir Harold Howitt resigned a year ago, but was persuaded by Lord Nathan to remain until future plans took shape.

CENTRAL AFRICAN EXTENSIONS

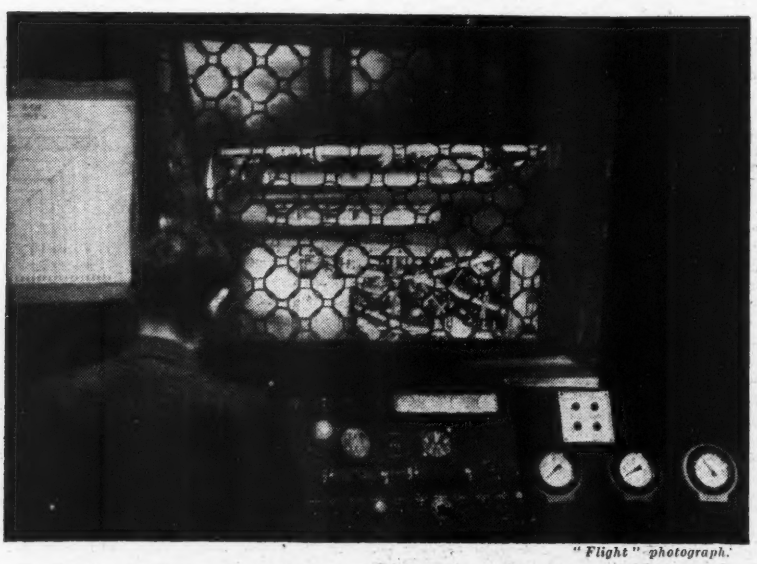
COMMENCING from the New Year, Central African Airways increased its services and six per week are now operated on the route between Johannesburg, Salisbury and Bulawayo, and three services per week between Salisbury, Ndola and Nairobi. The fleet at present consists of four Vikings and five Doves, but it is planned to replace Doves by Vikings on the Bulawayo-Ndola route and to extend this route to include Johannesburg. The Rapide service between Salisbury, Lusaka and Ndola has been discontinued.

It is understood that among new routes planned to come into operation are services between Salisbury-Livingstone and Bulawayo-Livingstone, which are designed to link up with the B.O.A.C. flying-boat service.

Air Chief Marshal Sir Frederick Bowhill, chief aeronautical adviser to the M.C.A., has gone to Southern Rhodesia to resume his work as technical adviser to the commission of enquiry which is examining certain matters concerning Central African Airways. The commission met at Salisbury, S. Rhodesia, in September, 1947, and resumed on January 12th at Bulawayo. Sir Frederick will sit as an impartial adviser with representatives of S. Rhodesia, N. Rhodesia and Nyasaland. This commission has no connection with the conference of governments which met at Victoria Falls in August, 1947, to discuss air transport matters in Central, East and West Africa, which Sir Frederick also attended as adviser.

K.L.M. DECLARES DIVIDEND

IN a review of K.L.M. activities during 1947, the Dutch company's turnover increased from 68,000,000 guilders in 1946 to approximately 94,000,000 guilders, the route-network expanded from 39,000 to 62,000 miles, the total capacity available increased from 57,200,000 to 97,688,500 ton/kilometres, and personnel from 6,627 to 11,000. A dividend of 4 per cent. is to be paid. A comparison between the first nine months of 1946 and the corresponding period in



"Flight" photograph.

IN MESH: A tester at the Rolls-Royce factory, Derby, sitting behind anti-submarine netting whilst a Merlin 620 power plant, complete with airscrew, is on test before installation in a Canadair IV aircraft.

1947 revealed increases of 30 per cent in the number of hours flown; 40 per cent in the distance flown; 4 per cent in the number of paying passengers, 104 per cent in the amount of freight, 32 per cent in the amount of mail carried; and an overall increase of 38 per cent. Several new services were opened, San José and Havana being added to the West Indies network; the special flights to Johannesburg were converted into regular weekly services; a new line was opened between Amsterdam and Lydda; and in Europe services to Glasgow, Manchester, Dublin, Frankfurt, Rome, Gothenburg, Marseilles and Hamburg were started. In all, K.L.M. operated services to 38 countries, and the frequency of existing services was also increased. The services between Amsterdam and New York were increased from two to four a week, to Batavia from four to seven a week, and on the South Atlantic route the service was doubled. During the summer a special freight service to New York was operated, and special flights were made to Moscow, Berlin, Holland (U.S.A.), Hanover and Teheran. Last August, the organization of Royal Netherlands Indies Airways was absorbed by K.L.M.

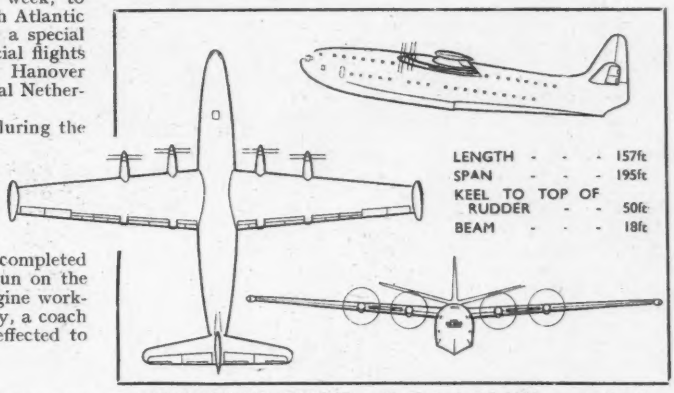
Several additions were made to the K.L.M. fleet during the year, including fourteen Douglas DC-3s, two L-49 Constellations and eleven L-749 Constellations. Seven Douglas DC-6s and twelve Convair-240s are scheduled for delivery this year. Ground organization has also been included in the general expansion, and several extensions and improvements have been made. A new airport terminal building was completed at Hato, the airport of Curacao, and work was begun on the terminal building at Schiphol Airport. The new engine workshop was opened at the latter airport early in January, a coach terminal completed in The Hague, and extensions effected to the K.L.M. Medical Division buildings.

PHILIPPINES ROUTES

AN air agreement has been concluded between Britain and the Philippines allowing both nations reciprocal terminal and transit rights for commercial airlines. The agreement designates routes for British airlines: Hongkong, Manila, British North Borneo, Sarawak, Singapore; Singapore, Sarawak, British North Borneo, Manila; and Hongkong, Manila, Netherlands East Indies, Australia. There are six routes for Philippine airlines: Manila, Hongkong; Manila, Hongkong, Shanghai, Japan; Manila, Hongkong, French Indo-China, Siam; French Indo-China, Siam, Burma, India, Pakistan, Middle East, Africa, Europe, London and/or points beyond; Manila, French Indo-China, Singapore, Netherlands East Indies; and Manila, British North Borneo, Borneo, Celebes, Timor, Australia.

ANSON CRASH REPORT

A REPORT has been submitted to the M.C.A. by the Chief Inspector of Accidents on the crash into the sea off the Isle of Wight of an Air Transport Association Anson on July 3rd. The pilot and radio officer were killed. After obtaining clearance from Jersey at 09.51 hrs, the aircraft took off for Southampton without having refuelled. At 09.52 a departure signal was received by Jersey from the aircraft giving an E.T.A. of 10.55 hrs, and at 10.07 hrs Eastleigh was called. Height, position and E.T.A. were given and the pilot stated that he was flying in accordance with Visual Flight Rules. At 10.12 hrs Eastleigh was asked for visibility and cloud base at the airfield, and visibility 4 miles, cloud 7/10 at 800ft and 10/10 at 1,500ft were given. Barometric pressure was not asked for or given. The aircraft obtained a true bearing from Guernsey control at 10.26 and at 10.29 again contacted Eastleigh, but was told to wait since the station was working another aircraft. After, the Anson was heard trying to contact Bristol transmission ceased but both Eastleigh and Bristol made repeated attempts to establish contact.



TRANSATLANTIC PROJECT: The French S.E.1200 powered with Pythons, which will give an estimated maximum speed of 435 m.p.h.

In his report, the inspector states the aircraft was properly maintained and had no known defects. He suggests that the pilot, as he did not request barometric pressure from Eastleigh, intended a visual approach and had not checked the setting of his altimeter. There was no evidence that he knew that the sea-fog off the I.o.W., which had been expected to clear up, still persisted. The wreckage indicated that the aircraft had crashed at speed, and the time coincided with the time at which fuel, which was sufficient for the flight, would have been exhausted.

BREVITIES

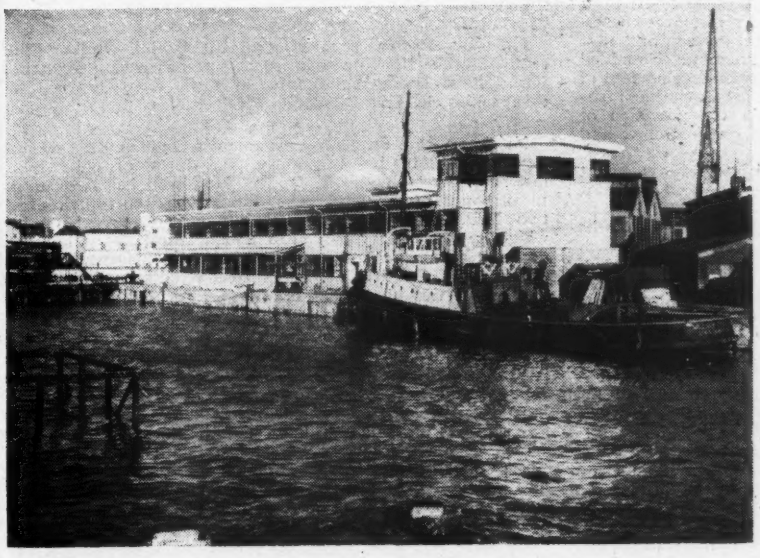
As a result of an agreement between Pan American Airways and United Airlines, effective from December 26th last year, passengers from intermediate points between Los Angeles and San Francisco, and north of San Francisco to Medford, Oregon, may now travel by Pan American aircraft to Honolulu for the same fare as from San Francisco and Los Angeles. The single fare is $150, and passengers starting their journey between Los Angeles and San Francisco may go via either of these two points, but passengers starting from north of San Francisco and using the concession will travel via San Francisco.

* * *

Three aircraft were used by Air Contractors, Ltd., on Operation India, and not two, as previously stated.

* * *

To encourage flying of light seaplanes the American Civil Aeronautics Administration recently proposed the building of about 250 seaplane bases throughout the country, with Federal and local government assistance, so that cross-country seaplane pilots would have landing and service facilities every 125 miles. The idea is to provide complete docking, fuelling and servicing facilities



STEP ASHORE: On the extreme left is one of the two floating docks, at which passengers will embark and land, at the new B.O.A.C. flying boat base at Southampton, and which will soon be in service. The terminal building is in the background.

Civil Aviation News . . . . .

on suitable expanses of water and in some cases to make artificial lagoons. The city of Tulsa, Oklahoma, is digging a lagoon 4,500ft long.

* * *

West African Airways have commenced a scheduled service between Accra, Kumasi and Takoradi, which is later to be extended to Tamale. D.H. Doves with 8 seats are used.

* * *

Jersey Airways, Ltd., the privately operated company whose services were taken over by B.E.A., has declared its last dividend—6 per cent for 1946. During that year, 74,646 passengers were carried; the 1938 total was 34,962.

* * *

G/C. J. Hutchieson, M.B., B.Ch., D.P.H., has been seconded from the R.A.F. to the Ministry of Civil Aviation as chief medical officer. He is to review the M.C.A.'s requirements and submit proposals.

* * *

It has been decided that the Ministry of Civil Aviation is to abandon for the present the development of Fairwood Common as the airport for Swansea. Fairwood will revert to R.A.F. control until the situation is reviewed in 1950.

* * *

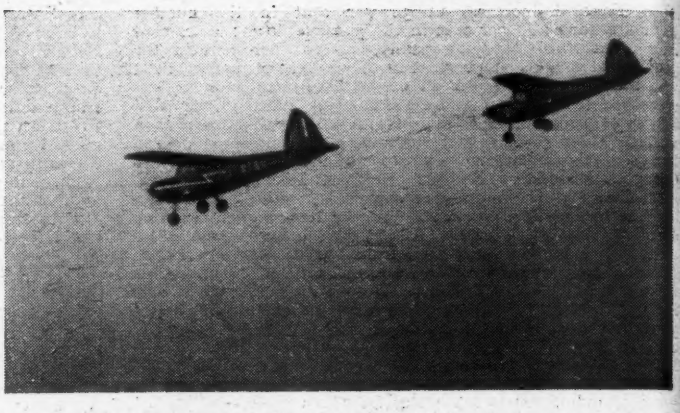
Mr. John E. Cook has been appointed Rates and Tariffs Officer of the I.A.T.A. He was formerly traffic manager of Braniff and of Continental Airlines, and in his new position he will supervise the preparation of joint tariffs on behalf of the international airlines from I.A.T.A. headquarters in Montreal.

* * *

Pan American Airways have filed a new tariff with the American C.A.B., increasing the fare level on Latin American routes by 10 per cent from February 1st. The fares will still be lower than the pre-war ones, however, in most cases. Pan American Grace Airways also is to increase fares for its west coast routes in Latin America.

* * *

Regular meetings of the air freight brokers on the Baltic Exchange began on December 29th. The first aircraft to be loaded through exchange channels left Nice on December 31st with a load of flowers for Croydon. It had earlier flown to Athens with radio sets, and the return charter was offered to Lambert Brothers' Aviation Department by Lep Air Services, and negotiated through Lamberts' agents in Marseilles, Watson, Browne and Co.



NOSE WHEELS FOR BABIES: Two Macchi M.B. 303 private aircraft in flight. The M.B. 303 two-seater is powered by a CNA-D.4 or Continental A65 or C.85, has a cruising speed of approximately 93 m.p.h. and a range of 340 miles at this speed in still air.

* * *

Air France have been using the 33-passenger Languédoc on the Paris-Nice route, to meet the seasonal flow of traffic to the Riviera, in place of the DC-3. Connections to Monte Carlo and Cannes are made by coach.

* * *

During 1947 Pan American Airways carried 39,700 westbound transatlantic passengers and 22,300 eastbound, an average of 170 passengers a day and a total of 2,200 Atlantic flights. On the New York-Bermuda run 40,000 passengers were carried. The airline carried nearly two million tons of freight during the year, more than double the 1946 total, and 1,153,000lb of mail.

* * *

The board of enquiry set up in America to examine possible safety improvements has recommended that all airlines appoint "safety directors" to reduce the risk of accidents due to mechanical failure. The board also proposed better training for mechanics and co-pilots, the development of safer fuels and lubricants, and changes in the location and construction of petrol tanks so that fires might be isolated more effectively.

FROM THE CLUBS

As a first step towards speeding up and increasing the output of trained flying and ground personnel in India, a conference of flying clubs and schools was held recently in New Delhi under the chairmanship of Mr. N. C. Ghosh, Director General of Civil Aviation. The chairman, in opening the conference, said that aviation in India was in its infancy and that there was need for development in every direction. He added that the Government was in favour of the rapid development of aviation and to this end was anxious to help aviation institutions in every possible way such as in the provision of facilities and the procurement of the necessary aircraft and equipment

Discussions at the conference revealed general agreement that more aircraft were needed for the development of training, and it was felt that the Government and the flying clubs should explore the possibility of obtaining more Tiger Moths or other proved training aircraft from abroad. Mr. Ghosh stated that an Expert Committee consisting of representatives of the R.I.A.F., the Civil Aviation Directorate and the firm of Tata were examining the question of what available aircraft and equipment could be salvaged from Disposals. He further revealed that the Government had established a Central Training School, at present in Saharanpur, for the training of pilots, ground engineers, radio operators and other technicians.

It was considered that flying clubs should be utilized for flying training in the initial stages when unsuitable men could be weeded out, and only selected pupils would then pass through to the Central Training School for advanced training. It was thought that such a policy would also provide aircrew who would eventually be suitable for flying in the airlines.

Besides the Director General and officials of the Civil Aviation Directorate, A.V-M S. Mukerjee, R.I.A.F., and representatives of the flying clubs of Bengal, Bihar, Bombay, Delhi, Madras and of the States of Hyderabad, Jodhpur, and Jaipur, the National Air Academy of Bareilly, the Sind Provincial Flying Club, and the Aero Club of India attended the conference.

* * *

Mr. Alan Brown, a member of the Umtali Gliding Club, recently broke the Rhodesian soaring record with a flight in a Kirby Kite, lasting 20 minutes at 1,580 ft. This feat has earned him the first Rhodesian "C" licence.

* * *

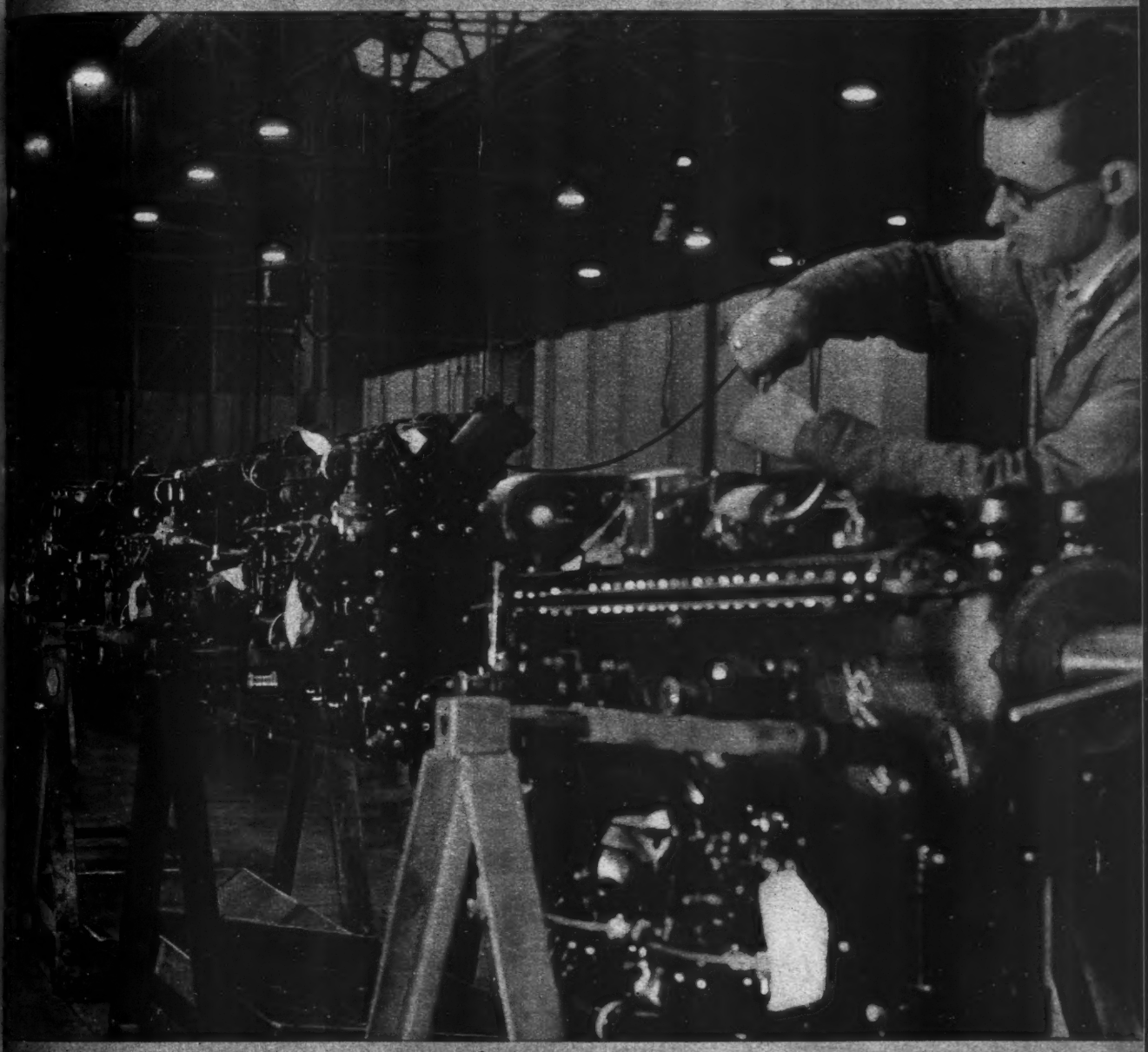
Mr. C. M. Joy, formerly assistant instructor at the Coventry Aeroplane Club, has taken over the duties of chief flying instructor from S/Ldr. E. G. Franklin, who has been acting in an honorary capacity. The club has written to Coventry's two M.P.s, appealing for their support for private flying, which, says the letter, may cease completely if the Government does not act on the recommendations of the Government committee and the Straight committee reports. The annual general meeting of the club is to be held on February 24th.

* * *

Over 2,000 hours were flown by the Wiltshire School of Flying during 1947 and the fleet has grown to nine—seven Austers and two Magisters—while there is a Proctor for internal and overseas charter flying. Early in 1947 the club moved from High Post airfield to Boscombe Down, where there are runways and an unusually smooth grass surface, a large hangar and well-equipped workshops. Mark Two Drem lighting is installed, and so the airfield is suitable for night flying. The former control tower has been converted into a clubhouse with a bar, restaurant and five bedrooms. A scheme for contracts involving blocks of flying hours at reduced rates is in successful operation.

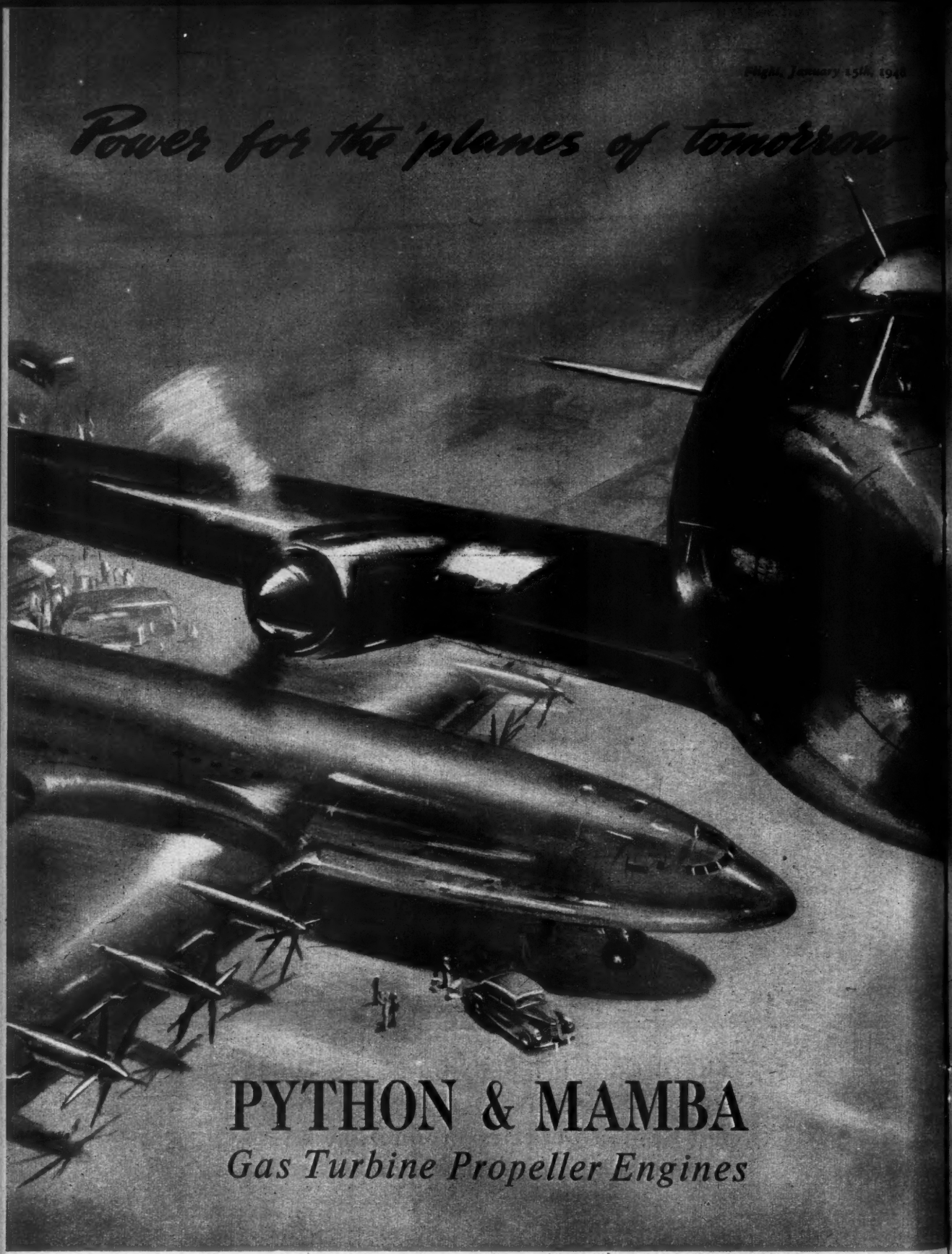
GIPSY QUEEN SERIES 30

unsupercharged engine of 250 b.h.p.



The direct descendant of the world-famous Gipsy Six of thirteen years ago and now in quantity production for the trainers and light transports of to-day

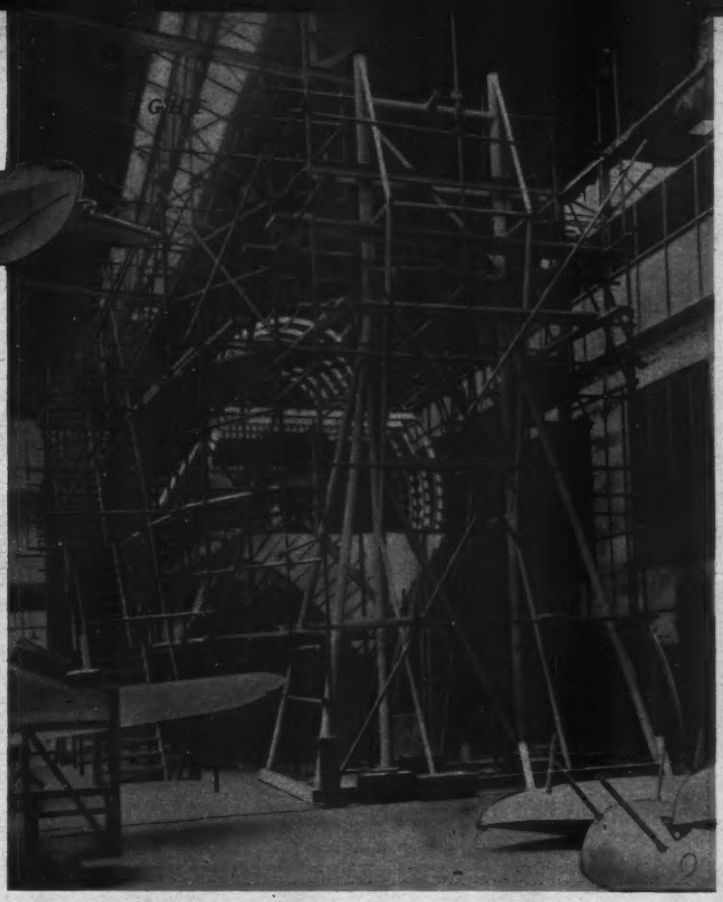
DE HAVILLAND ENGINES



ARMSTRONG SIDDELEY MOTORS LTD., PARKSIDE, COVENTRY

(Branch of Hawker Siddeley Aircraft Company Limited)

A156/2



SR/45

Preliminary Survey of the Big Saunders-Roe Flying Boat Now Being Constructed at Cowes

THE work of examining, analyzing and describing aircraft is an occupation of absorbing interest, yet by its very nature there exists an ever-present danger of being trapped into an attitude of mental glibness towards aeronautical developments. It is all too easy to become blasé about achievements which are very real and hard-won steps forward along the road of aviation progress; perhaps it is because development was so rapid during the war years.

This soliloquy is prompted by the feelings we experienced when entering the large hangar at East Cowes. The first impression registered is of a mass of steel scaffolding; then one picks out a silver-grey sheen of light alloy—the burgeoning hull structure of the big Saunders-Roe boat. (Or rather the most advanced of the three which are being built.) On walking into the middle of the hangar floor to try to get a better idea of the aircraft's size the idea grows, mistakenly, with memory of the Brabazon's slim tapering length, that this flying boat is not so big after all.

The mistake arises because the bow structure is not yet complete, and about forty feet of empennage has still to be added when the hull is advanced enough to be moved out of the jig. A foreshortened effect is thus gained which leads one astray. Proportion is restored, however (and in good measure) when one climbs up the four flights of steps to the top platform of scaffolding and can then look down into the partly built hull. This is truly impressive and restores at once the confidence that here is, after all, a very large aircraft indeed.

Some idea of the proportions of the hull may be gained from the accompanying photographs and drawings. In terms of figures, the midship dimensions are 5ft 7½in radius for the top half of the "bubble," and 7ft 3in radius for the lower deck, then the planing bottom extends down about eight feet below this. The overall height of the hull at the step station is 24ft 3in, whilst to the top of the fin the height will be 55ft 9in—just about one-third the height of Nelson's Column.

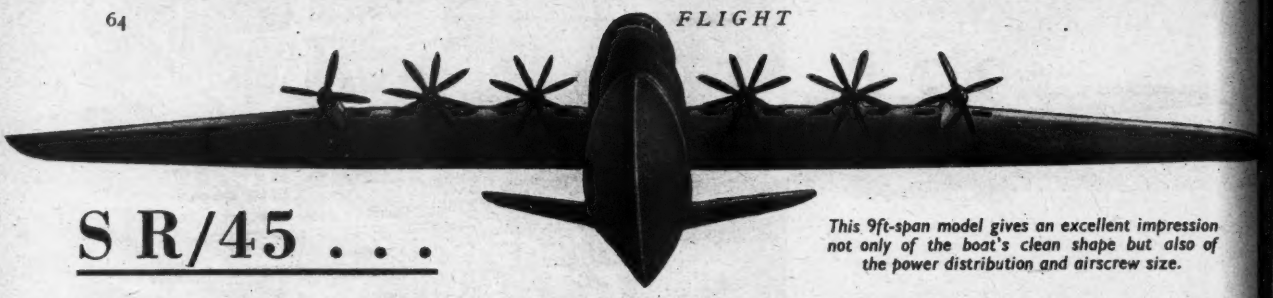
This is, perhaps, neither the time nor place to discuss the recent controversy regarding the decision whether to go ahead with the development of the SR/45 and the Brabazon; but it is relevant to state that, in our view, it would be a great loss in almost every sense if these projects were shelved. In the field of flying-boat design this country has a particularly good record and possesses unique design experience. Not to capitalize these advantages—and particularly in the light of the recent American revival of interest in marine aircraft—would seem to have every appearance of folly.

Many of the most formidable arguments against the flying boat are diminished, and some are quite eradicated, as the physical size of the aircraft is increased. Thus, by comparison with a landplane of SR/45 size, the additional form drag occasioned by a body shaped as a hull is negligible. Again, the increase in structure weight caused by having a planing bottom is offset by the obviation of having to carry a landing gear. The designed structure weight of the SR/45 is close to 28 per cent and this is a value which would be enviable in an orthodox landplane of similar size: in this connection it is not invidious, we feel, to point out that the estimated structure weight of the Brabazon is 31.93 per cent.

Deck Arrangements

For purposes of description the SR/45 can be regarded as being divisible into three layers, viz., the planing bottom, lower deck and upper deck. The employment of what has become known as a "double-bubble" section is, of course, due to the stressing claims of pressurization, but in this particular application it is rendered the more interesting by, as it were, being grafted on to an additional structure, the planing bottom. When considering the latter it seems a great pity that so much volume should be put to no accommodation purpose. The tremendous loads imposed on the planing bottom, however, make diaphragm bulkheads an essential, but employment of the intervening volumes even for baggage stowage is not practicable as access hatches in the deck would require to be pressure-tight and a certain amount of water is almost bound to be found in the bilges.

No hard and fast scheme of intended layout has yet been decided upon, but a full-scale mock-up of the hull



S R/45 . . .

This 9ft-span model gives an excellent impression not only of the boat's clean shape but also of the power distribution and airscrew size.

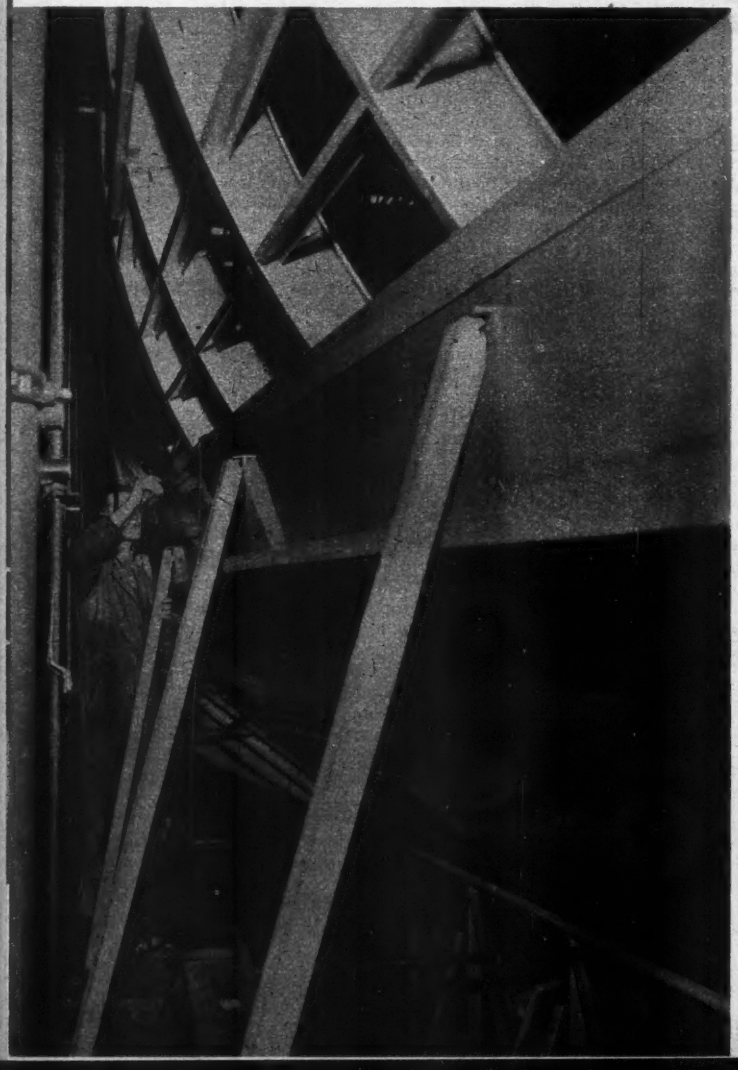
conveys better than drawings and imagination ever could the astonishing spaciousness to be found on both decks, and also gives a reasonable indication of the quality of appointment which may be expected.

When the machine is at rest on the water, the designed load-water-line is such that a tail-down attitude is given with the longitudinal axis of the hull at about four degrees to the horizontal. Thus it is that the threshold of the main entry door—which is on the port side just forward of the wing leading edge—is approximately three feet above the water line. This doorway opens into a spacious foyer, on the starboard side of which a semi-circular staircase leads to the upper deck. A central corridor runs fore and aft from the foyer, the forward accommodation comprising two two-berth cabins—in effect private staterooms—on the port side, these being complemented to starboard by a ladies' dressing room adjacent to the stairway with, forward, a four-berth stateroom beyond which is the crew's toilet. Access to the latter is from the No. 1 freight hold, which occupies the nose portion of the lower deck with the "eyes" or fo'c'sle given over to what is called the marine compartment; this is unpressurized and is, as its name suggests, the repository of all mooring tackle, etc.

The port rear corner of the entrance foyer is devoted to a dual compartment for the purser and stewards, whilst opposite across the rearward-running corridor is a gentlemen's dressing room and a two-berth cabin. Aft of these are a two- and a four-berth cabin respectively to port and starboard of the corridor which then, up two steps, gives entry to the day saloon. Seats for twenty-five passengers are disposed in this compartment in five rows divided by an aisle into triple seats to starboard and paired seats to port.

A doorway in the after bulkhead of the day saloon gives access to the promenade bar, a spacious place of cheer with a cunningly designed counter which sweeps round to blend into the wall of the staircase leading down from the upper deck. Seats are provided in the bar for those who do not wish to "promenade," but for those who do there is additional standing space in the corridor running along the port wall back to No. 2 freight hold. The latter is the rearmost compartment on the lower deck. Behind the staircase on the starboard side is a gentlemen's dressing room; and the rear entry door for passengers, which is subsidiary to the forward door, opens directly into the promenade bar.

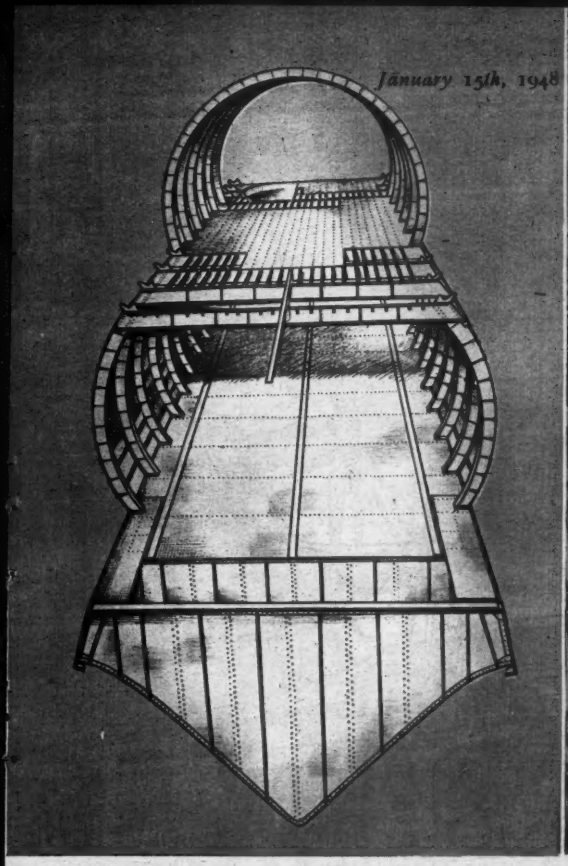
Looking forward along the afterbody chine on the port side one here gets a good idea of size and construction. Note the girder-braced keel-support jig.

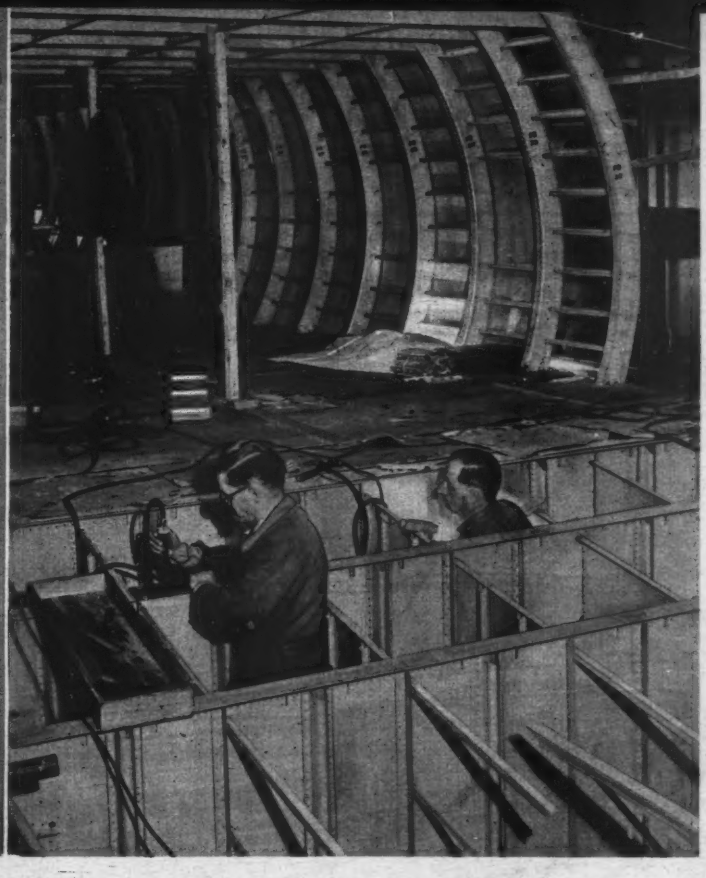


Upstairs the rearmost compartment of the top deck is allotted to the ladies' dressing room, immediately forward of which are three Pullman-type cabins of substantially similar size, seating thirty-two passengers between them. The chairs are arranged in facing pairs, each of which share a common table, and a central aisle runs through all three cabins from the stair head up to the steward's pantry. This latter is shallow, but of full thwartships length, and is situated immediately aft of the wing centre-section torsion-box. The wing-box spanning the hull is not pressurized, and beneath it is arranged a food-conveyor linking the steward's pantry with the galley on the forward side of the centre-section. Beyond the galley is the lounge/dining room, from the starboard rear corner of which leads down the stairway to the entry foyer; the remainder of the upper deck forward of the lounge is the preserve of the flight crew.

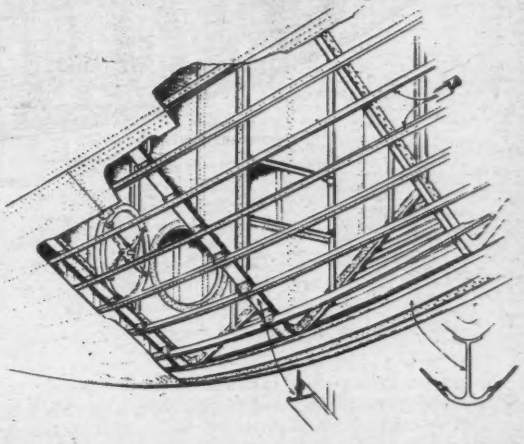
Crew Quarters

Although there is a doorway in the bulkhead dividing the lounge from the crew's rest-room, access is also afforded by a jack-ladder leading up from No. 1 hold. From the rest-room (which, presumably, will be furnished with berths-cum-chairs) entry is given direct on to the flight deck. As naturally to be expected, this is an exceedingly roomy compartment, with a centre-line length of more than 16ft and a maximum width of over 10ft. In the port rear corner sits the radio officer facing aft, with his multifarious items of equipment mounted against the bulkhead in front of him and along the port wall on his right. The radio officer sits back-to-back with the navigator, whose chart table is mounted athwartships from the port wall. To starboard sit the two flight





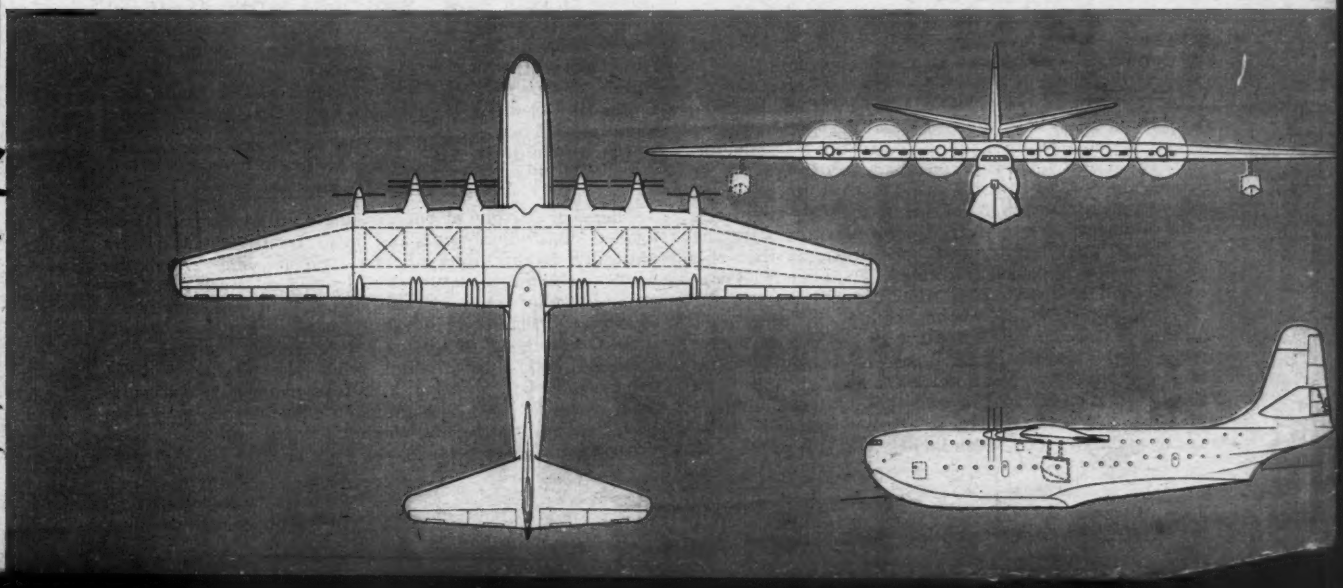
The above drawing and photograph clearly show the general structural form of the hull, the view in each instance being taken from the step region looking toward the tail. At right is a detail sketch illustrating the massive construction of the planing bottom, this being designed to cope with the very considerable load of over 40 lb/sq. in.



BASIC DATA

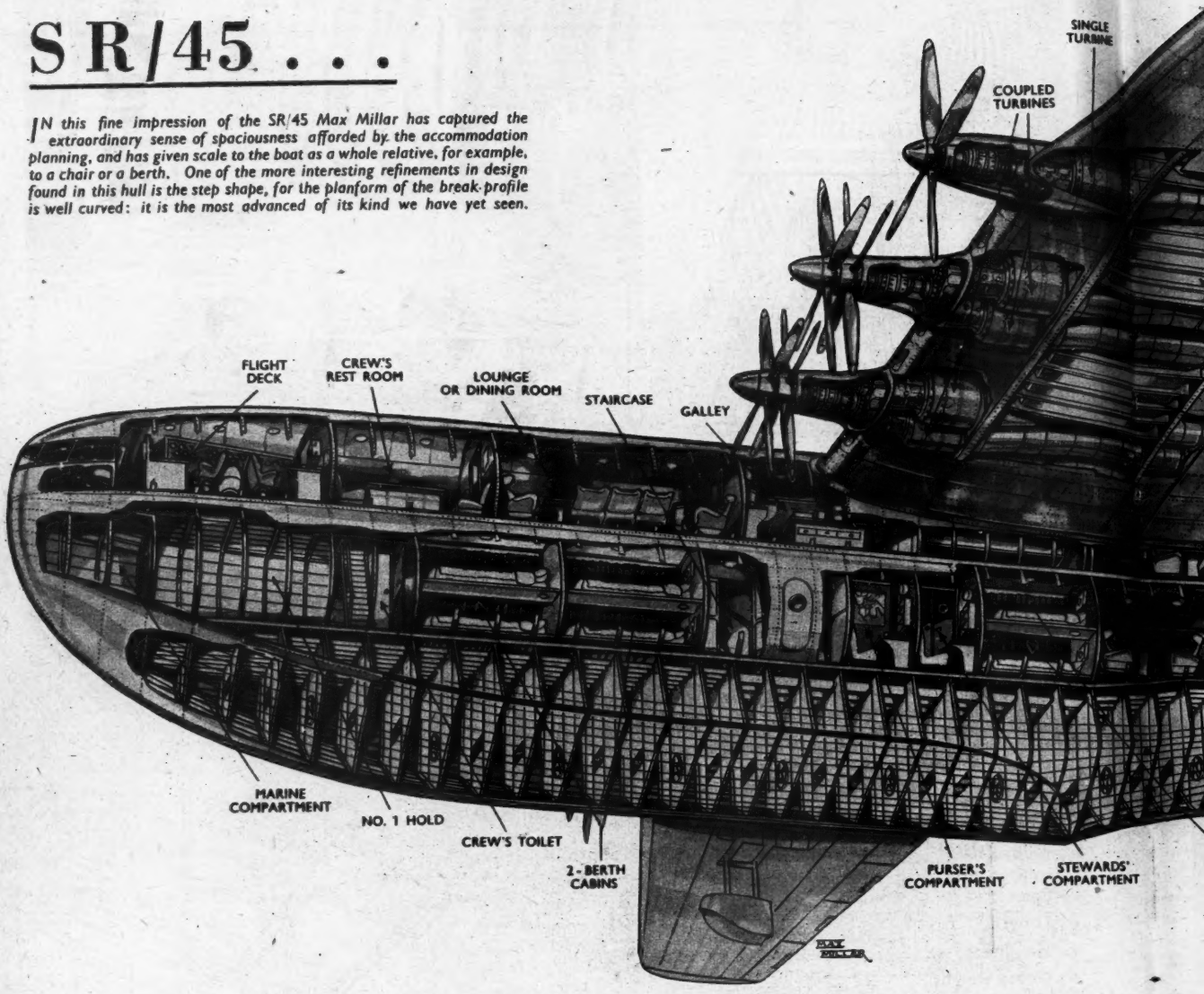
Ten Bristol Proteus airscrew-turbines of approx. 3,500 e.s.h.p. each

Span	219ft 6in
Length	146ft 0in
Height	55ft 9in
Gross weight	135 tons
Range...	5,500 s.a. miles
Cruising speed	Over 350 m.p.h.



SR/45 . . .

IN this fine impression of the SR/45 Max Millar has captured the extraordinary sense of spaciousness afforded by the accommodation planning, and has given scale to the boat as a whole relative, for example, to a chair or a berth. One of the more interesting refinements in design found in this hull is the step shape, for the planform of the break-profile is well curved: it is the most advanced of its kind we have yet seen.



engineers facing their instrument control panel; this is an impressively comprehensive unit which is offset from the wall so that access is provided to the rear of the panel for instrument and control maintenance.

Conventionally, the captain and first officer sit in the extreme nose of the aircraft, one on each side of a central control pedestal. Although each pilot is faced by a standard blind-flying instrument panel, the facias are remarkable for a reduction in the number of instruments fitted by comparison with the glut which has grown almost to the stature of a tradition. This paucity of instrumentation is paralleled by the few ancilliary controls: master indications and master controls only are given to the pilots, the individual controls being operated by the flight engineers.

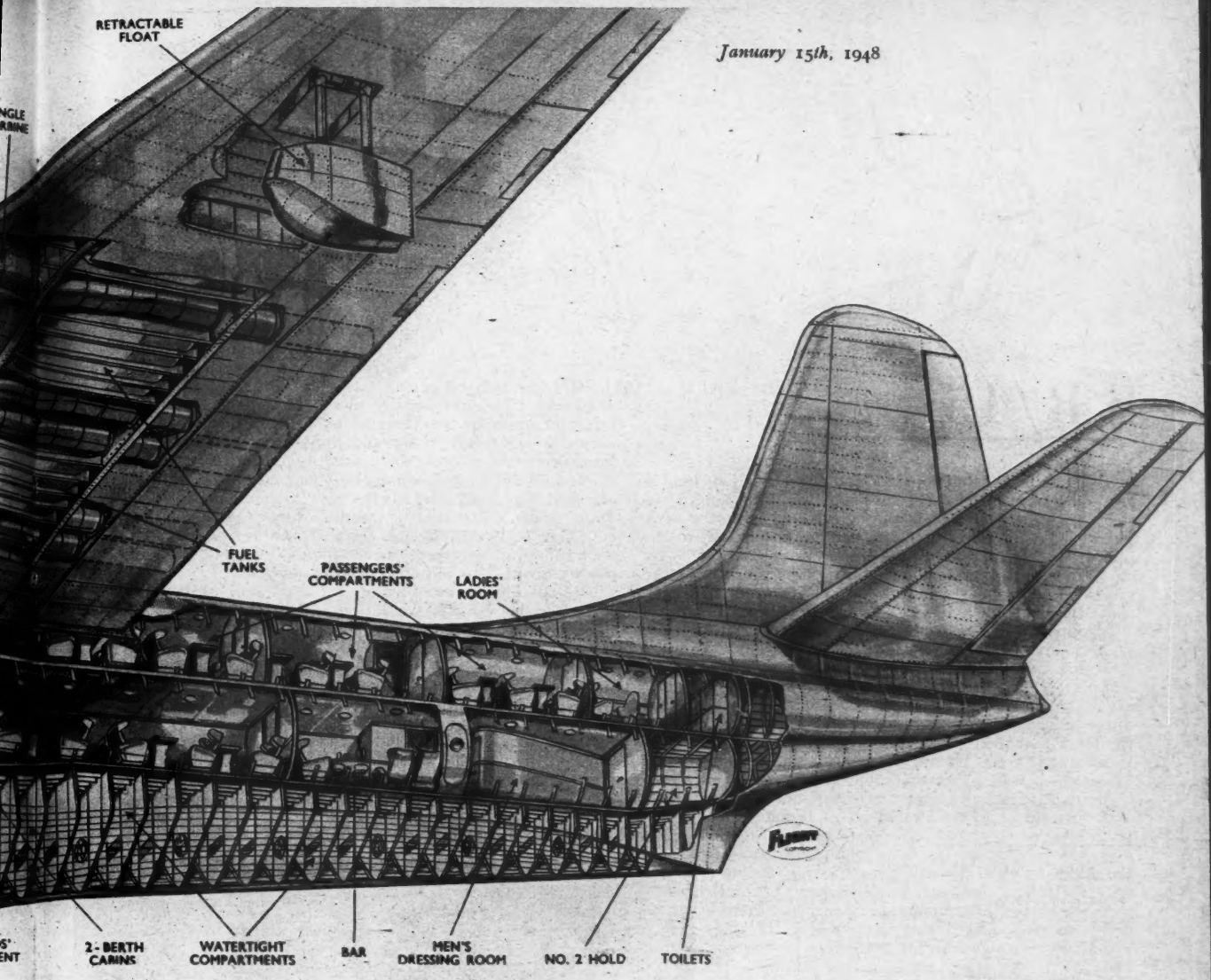
At the moment we can deal structurally only with the hull of the SR/45, but it is at once apparent that this reflects the well-established tradition of Saunders-Roe constructional practice. Working from the bottom up, the keel is (appropriately) an anchor-section extrusion with the plating of the planing bottom picking up to the flukes of the "anchor" and the profile members of the diaphragm bulkheads riding across the "stock" of the anchor. The space between the skin plating and the bulkhead profile is occupied by Z-section extruded stringers pitched at an average of approximately seven inches.

The bulkhead profiles are formed with beaded T-section extrusions, whilst the diaphragms are stabilized with rolled bowler-hat and extruded angle-section vertical members riveted on both faces. Every third bulkhead—although there are occasional exceptions—is made watertight, the limber holes formed by inter-stringer spaces being, to this end, blocked by rubber filler-pieces set in Bostik. At the chine a heavy-gauge, rolled, angle-section butt-strap unites the topside and planing-bottom skins, the sectional angle of the butt-strap varying, of course, from one hull station to the next.

High Quality Plating

The skin plating of the planing bottom is made with joggled longitudinal joints and butt lateral joints, the latter naturally having internal butt-straps. Throughout the whole of the hull structure skin riveting is "flush" and the general quality is considerably higher than that usually encountered; certainly, the skin gauge is low but, nevertheless, it is good to see the sort of results which can be obtained with flush riveting when the plating is thick enough to resist "quilting." It is no exaggeration to state that, if the SR/45 hull were given even but one very thin coat of paint the riveting would be imperceptible.

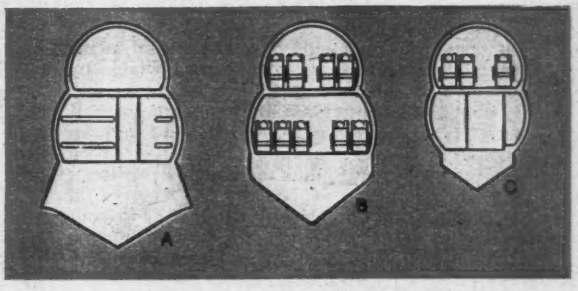
All mating faces below lower deck level are coated with

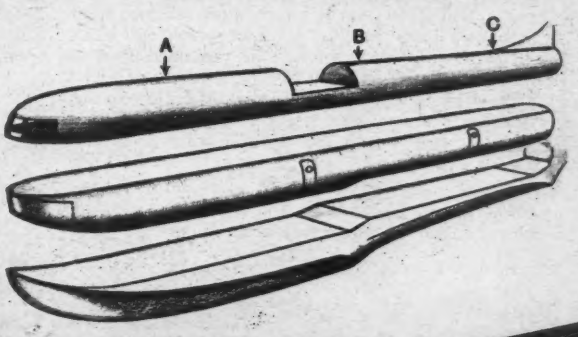


marine glue—a good old boat-building practice—but above this, that is in the pressurized section, mating faces are coated with Bostik solution S15/606. Rivets are hand-selected by testing in depth-gauges so that over-long or short rivets are rejected: each hole is also filled with the Bostik solution before the rivet is inserted, and fillets of solution are applied to all internal joint-runs where leak paths might start. In this connection it is worthy of emphasizing that the SR/45 is designed for a cabin pressure differential of 8½lb/sq in.

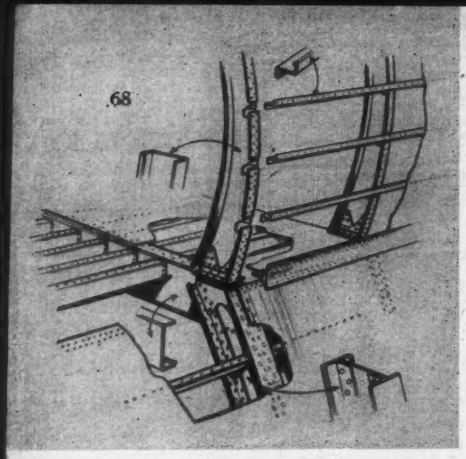
The lower deck plating is supported on a grid framework made up with the top members of the planing-bottom bulkheads and fore-and-aft I-beams. The rectangles thus formed are subdivided by drawn Z-section stringers alternating in pairs with the beams, but these stringers are themselves intercostal to extruded transverse I-joists paired between bulkheads.

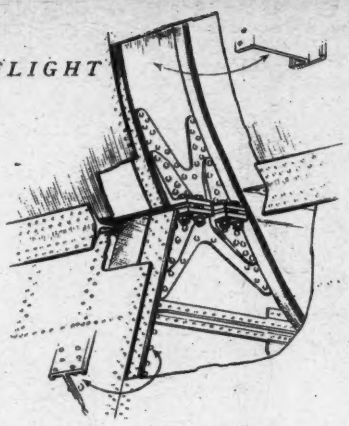
Lower-deck hull-frames are heavy-gauge pressings made up into I-sections and attached at deck level with four forged fittings (two per side) which are through-bolted to similar fittings riveted to the bulkhead. The skin panelling





Representative sections of the hull showing change in profile, and "layers" of planing bottom (unpressurized), lower deck and upper deck. The marine compartment in the lower-deck nose is also unpressurized.





Details of "waists" in hull between (left) upper and lower decks and (right) lower deck and planing bottom. Here are shown the differences in upper and lower frames, the frame anchorages, and use of the Y-section longitudinal butt-strap.

SR/45 . . .

of the planing bottom topsides and the lower half-bubble are joined at the deck-level "waist" by a Y-section extrusion, the stem of which is through-riveted with the deck plating. As the lower-deck stringers are intercostal to the hull frames, the webs of the latter are pierced only by 1in x ¼in slots for passage of the butt-straps which unite the stringer free-flanges; stringer webs are attached with large shear cleats on one side and small angle clips on the other.

In opposite fashion to this, the upper-deck frames are pressed channel-members notched for passage of the stringers, the latter being, as in the lower deck, rolled Z-section members. At the upper deck "waist" the frames are united by doubling plates whilst the skin plating of the upper and lower half-bubbles meet at and are joined by a similar Y-extrusion to that used at the lower waist.

Although in the planing bottom all linear members are extrusions, these are remarkable chiefly for their rarity in the hull structure above. Stringers are rolled members and, forward of frame 13 and aft of frame 32 (the frame pitch is 28in) the frame "booms" are heavy-gauge pressings. Between these stations, that is to say in the middle body of the hull from the wing leading-edge aft, the maximum amplitudes of bending moment occur, and the frame booms are extrusions; to complement this the stringers in this r ion are 16-gauge whereas in the fore- and after-body of the hull they are 18-gauge.

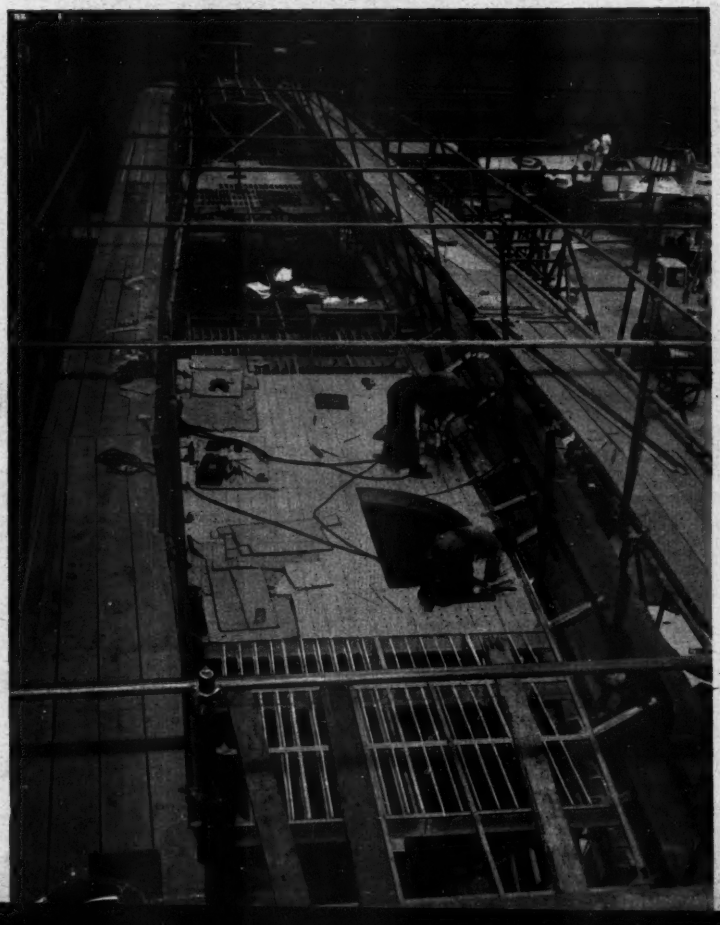
Power Installation

Little can be said at this juncture about the wing and power-installation aspects of the SR/45. The aerofoil section to be used is of a t/c ratio appropriate to a cruising speed of 350 m.p.h., which we calculate to be of the order of 17 per cent at the root tapering to something over 11 per cent at the tip; the section ordinates have been calculated by Saunders-Roe themselves. The intention is that the wing shall comprise a centre-section of 27ft span carrying inner-wing panels extending 40ft 3in to connect up with the outer-wing panels which project a further 56ft; thus the overall span totals 219ft 6in.

Power is to be provided by ten Bristol Proteus airscrew-turbines mounted in four coupled pairs, with two single outboard units. The power installation is particularly interesting in that each pair of coupled Proteus will jointly power a two-stage reduction gear, the final stage of which will drive a contra-rotating airscrew; the outboard Proteus will each drive a single blade-bank airscrew. This drive scheme will presumably incorporate clutches whereby a defective engine could be uncoupled in order to relieve its fellow of the burden of driving it.

The proposed operating procedure is to use full engine power for take-off, and then immediately to throttle back to 97½ per cent power for steep-angle climb up to about 30,000ft, this taking approximately three-quarters of an hour. (Since the Proteus is said to have an e.s.h.p. of about 3,500, the L/D for take-off can be reckoned as approximating to 10.8, whilst for climb at the quoted percentage power the L/D increases to about 11.1—values which promise an ample power safety factor and argue a pretty brisk performance.) At 30,000ft the aircraft is put into a low-angle continuous climb, maintaining 97½ per cent power, until an altitude of 40,000ft is reached after about 12½ hours. The outer single units are then throttled back to the idling condition and half of each coupled unit is also throttled back. The aircraft then "power-glides" down to sea-level, taking about fifty minutes for this operation.

Presumably, after having achieved an altitude of 30,000ft, the aircraft would be levelled-out and, to all intents and purposes, the major portion of the flight would be made "straight and level." The fact that the aircraft gradually climbs another 10,000ft during the ensuing 11½ hours is, we imagine, due to the changing L/D resulting from fuel consumption; it is patent that no human pilot could hope to hold an aircraft in a progressive rate of climb of 15 ft/minute. Additionally, there are grounds for comment in the fact that the cruising power should be so high a percentage of the maximum as 97½. The turbine's characteristics in this matter are well known, but we should have thought a percentage power of between 70 and 80 would be rather more appropriate.



Looking forward and down on to the top deck of No. 1 (the most advanced) hull a fine sense of shape and size is imparted.

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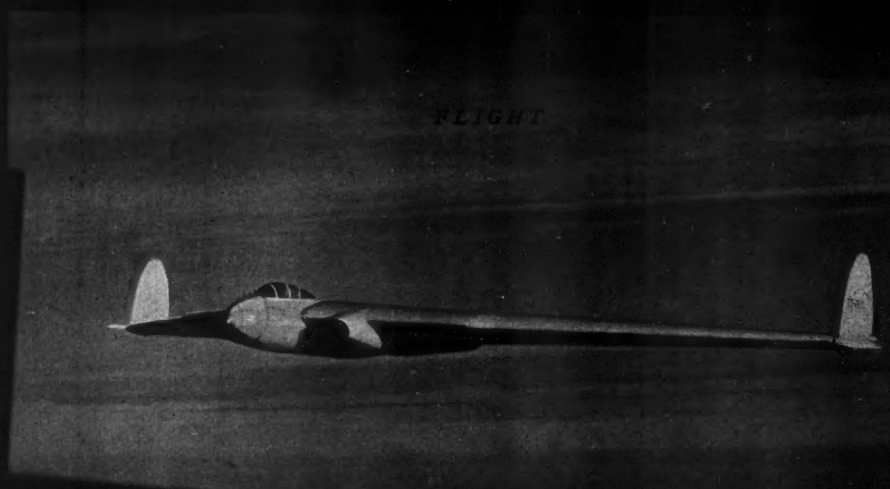

ON THE WING

A.W.52 Air Tests Commence : Control Systems

Illustrated by "Flight" Photographs and Sketches

THE purpose and principal characteristics of the A.W.52 and its forerunner the 52 glider are now familiar to most people, but the occasion of the presentation of the first aerial photographs of this outstanding, nationally and internationally important, aircraft seems to call for a statement of the present position and of progress made to date. It should be noted, in passing, that the fact that S/L. Franklin was prepared to fly this unconventional prototype in close proximity to another aircraft—a Lincoln carrying our photographer—is significant in itself. Since its first flight from Boscombe Down on November 13th, weather conditions have been such that only three or four flights have been possible. It is seldom that sufficient confidence is felt in even a conventional prototype for it to be flown in formation within five hours of the first take-off.

As has been stated previously, unexpected hydraulic troubles held up the flight of the A.W.52 for about twelve months. It may be as well, therefore, to refresh memories of some of the details of the control systems, which were described, together with the construction and other features, in *Flight* of December 19th, 1946, at the time when the aircraft was being completed. It will be remembered that the first public demonstration of the A.W.52 was given one year later, on December 16th last, and some notes on this, and the part the aircraft is playing in the country's research programme, were contained in our Christmas Day issue.

If the ultimate aim of minimum drag is to be achieved by resorting to all-wing designs, i.e., by discarding the fuselage and tail surfaces and burying the engines, a great deal more must be learned about stability and control of tailless aircraft. This is, of course, the purpose of the A.W.52 research machine. That which has already been learned from the A.W.52G, and from models in the wind tunnel since early 1943, when the design was commenced, is illustrated by the performance of this first unpowered Armstrong-Whitworth tailless machine, and also by the encouraging initial impression given by the Nene-engined A.W.52 itself.

So far, the maximum lift coefficient achieved with a tailless aircraft has been appreciably lower than with a conventional layout ; on the 52 a figure of 1.6, flaps-down, has been achieved. This inherent disadvantage, the subject of considerable investigation, is one of the most important problems in connection with tailless aircraft. One of the reasons for the low maximum lift coefficient is the nearness of the controllers (combined elevator and aileron surfaces) to the centre of gravity and the resulting increase in down load on their surfaces

necessary to correct the pitching moment at low speeds.

Most of the observations so far made by S/L. Franklin have related to details of equipment and lay-out—the positioning of controls, the functioning of the new type of electrically operated fuel cocks, etc. Very naturally he is reluctant, at such an early stage, to say much about handling, but it is known that, like the glider, the powered machine is considerably more sensitive on fore-and-aft control than is an aircraft with tail surfaces. Directional control of yaw by the wing-tip fins and rudders is good, and these surfaces at the end of the long lever arm of the wing can also be used to aid manœuvring on the ground. The rudder surfaces are differentially geared. Provision is made for a steerable nose wheel in the design, but so far it has not been put into operation.

The pressurized two-seat cockpit of the A.W.52 is neat and well arranged, as may be seen from the special *Flight* drawing on another page. It will be seen that the pilot sits slightly to the port side of the aircraft centre line, and the whole enclosure is, in fact, three inches offset to port. Considerable attention has been paid to safety, and a jettisonable enclosure and ejector seat are provided. There is also a device which locks the control column and wheel forward against the instrument panel to make certain that it shall not obstruct or injure the pilot as he is ejected. The interconnected corrector and flap levers are clearly indicated on the port side, behind the throttle levers, and the four dials which indicate the control surface angles are placed low on the starboard side. In the centre of the spectacles on the control column is the steering wheel which controls the nose wheel for manœuvring on the ground.

An important feature of the control system is the interconnection of the corrector surfaces and flap. The purpose of the corrector is to provide a powerful fore-and-

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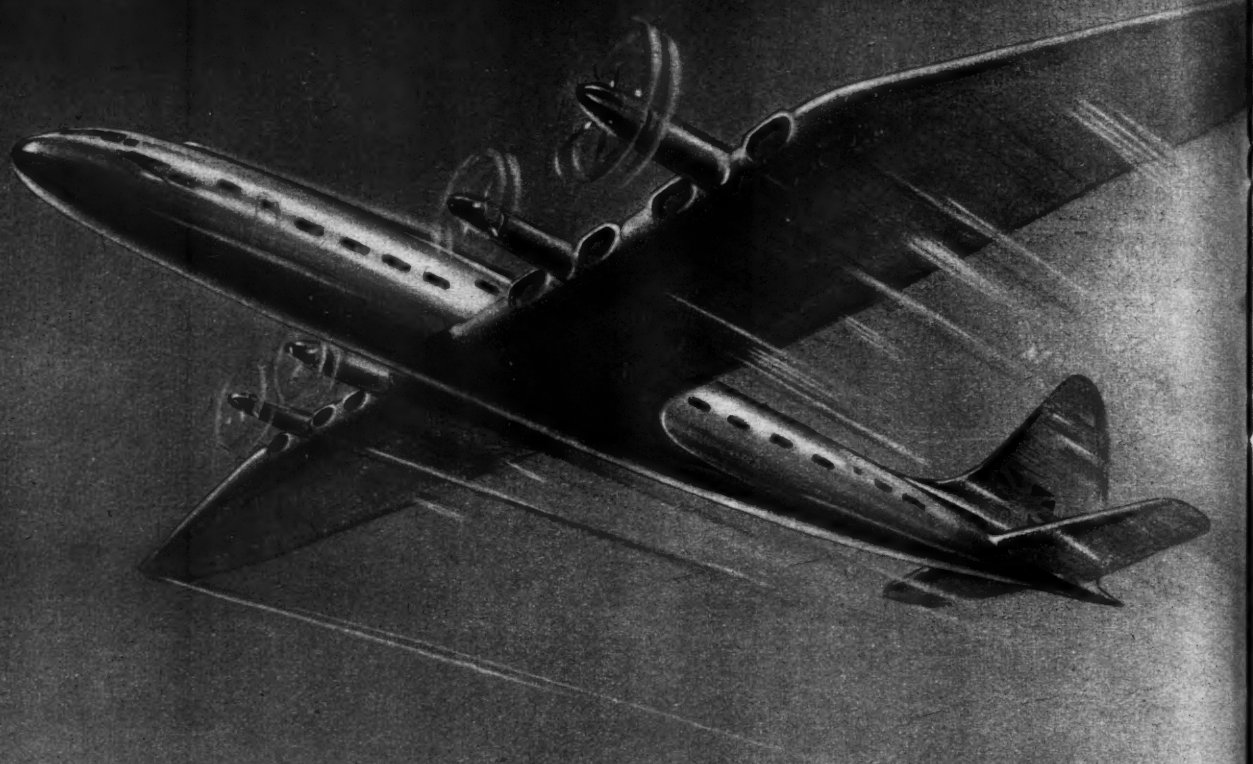

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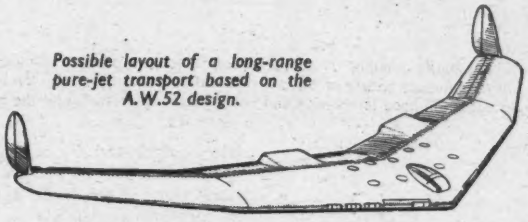
Blending with the snow-covered fields below, as if in winter camouflage, the A.W.52 sails over the Warwickshire countryside.

On the Wing . . . . .

aft trimming device which will not impair the lightness of the primary flying controls. Stick-free stability has been the aim from the start. One of the first things to be established during early flight trials will be the degree of automatic movement of the correctors relative to the flap, and the speed with which they are to move. Completely automatic movement of the correctors to follow the pilot's operation of the flap is not foreseen, and the present twelve degrees maximum upward movement of the corrector is produced half automatically and half by the movement of the corrector lever. In the case of the A.W.52 glider, corrector movement at the rate of 1 degree per second was found to give the best results, and it is expected that it will be settled at the same rate in the case of the powered 52. The control lever in the cockpit resembles a multi-position flap lever, with thumb release button on top and each quadrant position representing a degree movement of the corrector.



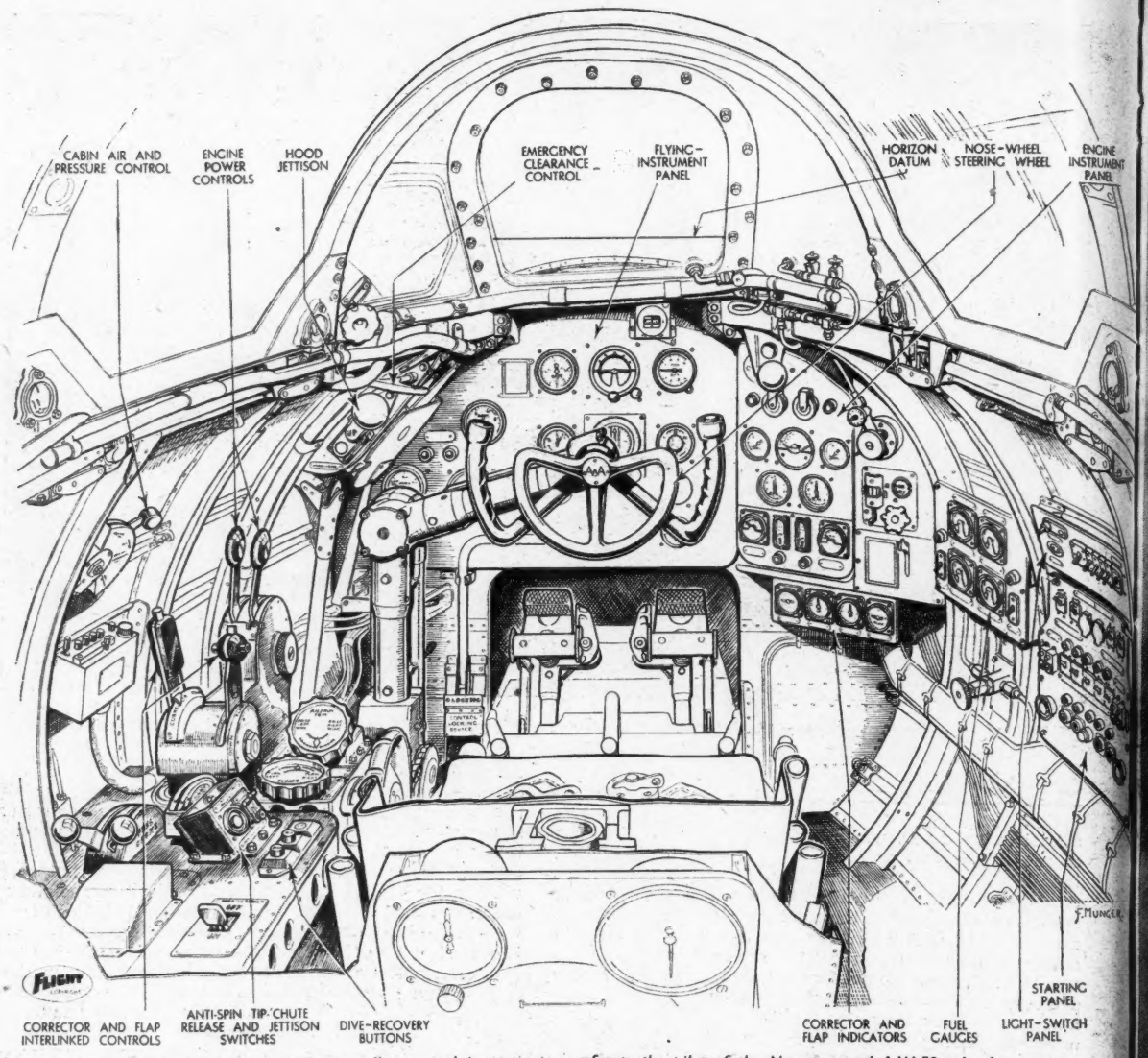
Possible layout of a long-range pure-jet transport based on the A.W.52 design.

In view of the very large speed range of the A.W.52 (100-500 m.p.h.) and the permitted range of c.g. position, the problem of selecting corrector angles and speed of movement will be very much greater than for the glider. It has been said that one of the major weaknesses of all the all-wing design is the closeness of the fore-and-aft c.g. limits. This is to some extent true, but in the case of the A.W.52 a movement of the order of 7 per cent of the mean chord, that is, about 12 inches, is allowed at present. This is rather more than half that of a conventional civil transport of to-day. The Skymaster, with a movement of .16 to .32, is something of an exception.

To overcome the tendency of swept-back wing tips to stall before the rest of the wing, provision was made on the 52 to remove the boundary layer immediately in front of the control surfaces by suction. A series of narrow slots (¼in wide) are located spanwise in front of the corrector at approximately half chord. This, incidentally, coincides roughly with the position where the wing ceases to be designed for laminar flow. So far, suction has not been used on the 52, but its effect was examined on the glider, which was similarly provided. The suction is obtained from the intake ducts of the Nenes, and the degree of suction is controlled by pairs of flaps in these intakes. When the system is put into operation, the suction flaps will be under automatic control from both the throttle and the elevators.

In general terms, the purpose is to increase the amount of suction at the slots progressively as the stick is moved aft of the neutral position and/or the throttle position reduced to 8,000 r.p.m. engine speed or less. In the extreme case of closed throttle, and stick well back (as for instance on landing), the flaps are at their full-open position and suction is at a maximum, while for the extreme use of either elevator or throttle separately, the flaps answer with a movement up to 40 per cent open.

The use of full suction, 60-70 cu ft/sec, results in the loss of some 300 lb of thrust from the Nenes. In the case of the stick being moved far back with throttle full open, as might occur in a tight turn or possibly on a take-off, some 50 per cent of the total suction could be applied. The resulting loss in thrust, although it occurs at a critical time, is for practical purposes small enough to be ignored. The suction ducts from the two Nenes are interconnected by a balance pipe, and the system includes a plenum or settling chamber in the wing beneath the slots on each side. Ultimately the removal of the boundary layer from the entire wing may be attempted, using gas turbine power plants drawing their whole air supply from this source to



A spacious, pressurized cockpit, with functionally grouped instruments, confronts the pilot of the Nene-powered A.W.52. In this special Flight drawing there is little to indicate the unusual nature of the aircraft and its control system. Note, however, the inter-geared corrector and flap levers on their quadrant, the hood jettisoning and control-locking devices, and the nose-wheel steering wheel.

On the Wing . . . . .

provide the suction. However, not only would this necessarily increase the breathing problems already experienced with gas turbines, but the design of the air ducting within the wing would be a most formidable problem.

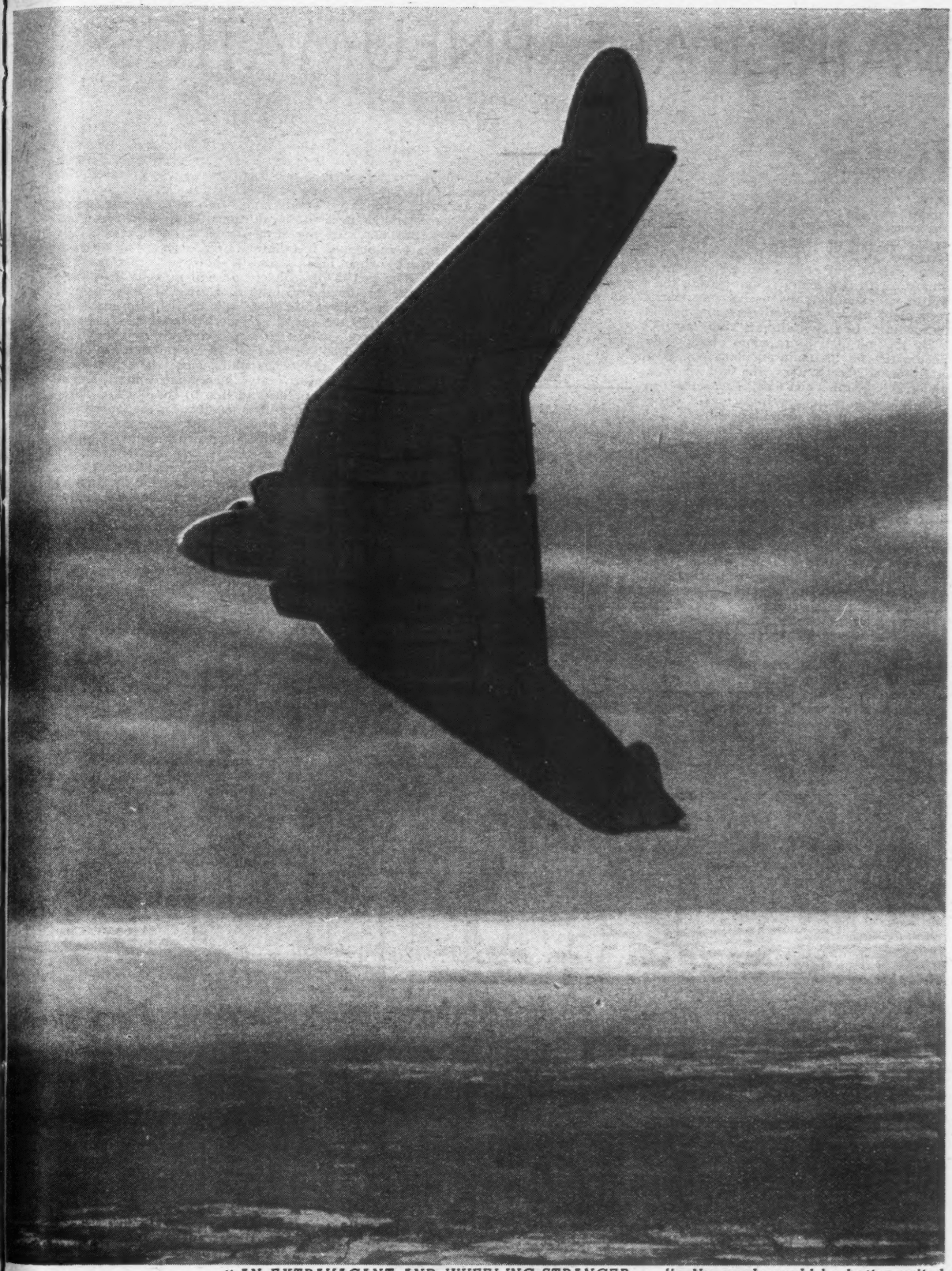
Actuating Mechanism Re-design

The thermal de-icing system, sealed and pressure-balanced control surfaces, and other advanced features of the A.W.52, have already been described in previous articles. However, as a result of difficulties encountered in the operation and synchronization of the correctors, there has been a substantial re-design of actuating mechanism. On an aircraft so sensitive to trim and depending upon its controllers for both elevator and aileron effect, it is imperative that synchronization or differential movement be exact, and that provision be made for a possibility of failure in the power services. The correctors are each operated by three screw jacks with chain interconnection, and each trio is operated by a single hydraulic ram. So far this system has proved satisfactory, but from weight considerations alone it would be unsuitable for a larger all-wing civil or military transport.

The second A.W.52 will be more truly an all-wing aircraft because the slight bulge required for the Nene nacelles can be reduced by several inches and still accommodate the Derwent nacelles. At a much earlier stage the use of axial-flow power units, which could have been accommodated within the wing depth, was considered, but at that time it seemed improbable that such units could be made available when they would be required. The performance of the Derwent-engined machine will be considerably less than that of the first Nene-engined version, and it is not expected that the reduction in under-wing nacelle bulges will produce any appreciable aerodynamic effect.

From the foregoing it will be seen that in the A.W.52 we have an instrument of research which promises access to wide fields of development hitherto denied to British designers.

A full description with cutaway drawing of A.W.52 appeared in "Flight" of December 19th, 1946.



"AN EXTRAVAGANT AND WHEELING STRANGER——": No words could be better suited to this ethereal portrait of our new tailless aircraft than these from Shakespeare's OTHELLO.

AIRCRAFT PNEUMATICS

Some Current Applications

By
A. H. A. BASTABLE, A.M.I.Mech.E., A.F.R.Ae.S., Grad. I.P.E.

DURING the recent war, advances were made in the applications of compressed air to aircraft auxiliary power circuits. Originally used for powering wheel brakes and guns, compressed air operation was later extended to various engine controls. These extensions in the use of pneumatic components were largely rendered possible by the development and large-scale production of a suitable compressor of high performance and low weight. Satisfactory performance of pneumatic systems in Service aircraft led to their installation in almost all British aircraft built during the war, and the possibilities of extending the use of pneumatics still further were recognized by aircraft designers who had an eye to the future on medium-sized civil aircraft and trainers.

By the end of the war, more than one designer had adopted pneumatics for his main ancillary power supply to operate, in addition to wheel brakes, the flap and undercarriage rams and local extensions such as engine priming. In each case a saving in weight was found by comparison with other power forms. Depending on designers' choice, these systems worked on pressures of either 450 or 600 p.s.i. In most cases these generating system pressures were reduced to a lower figure for ram operation to take advantage of the expansion factor in compressed air, so that any normal drop in bottle pressure is not reflected in the ram.

Because Service Embodiment Loan Equipment was later based on a compressor pressure of 450 p.s.i. some trainer pneumatic systems were designed around this equipment, and a reasonable weight-saving by comparison with other power supplies was found. This advantage, coupled with those of a reduction in the number of power services, a greatly reduced fire risk and a clean operating medium, has led to the adoption of compressed air at higher pressure in more recently developed training aircraft.

In civil aircraft the same trend appears, in that with developments in compressor design it has proved economical in some cases to increase the working pressure, since a system weight reduction is achieved. The final choice of pressure, therefore, rests largely with the designer, who must decide on the economics of the aircraft and on the availability of servicing equipment on the routes on which their products will fly. Present trends show, however, that for some time to come the economical generating pressure for most aircraft would appear to be 1,000 p.s.i. and this pressure is being accepted by the operating companies both at home and overseas.

When designing an aircraft pneumatic system, the basic aim should be simplicity, since this means, in most cases, the least weight, lowest cost and reduced maintenance. There are cases where secondary considerations due to undercarriage or flap characteristics necessitate additional equipment for satisfactory operations. In Fig. 1 is shown a pneumatic circuit based on a twin-engined installation. Fig. 2 shows an alternative approach, while Figs. 3 and 4 show yet other possible solutions. The merits of each circuit will now be discussed.

Tracing the circuit shown in Fig. 1, it will be seen that each compressor delivers air, not only to the two main air bottles, but charges the emergency air bottle when necessary. This storage system enables either compressor to charge all three bottles, if required, without loss of air through the other generating units, since there is a non-return valve incorporated in the regulator next in line to the bottles. Frequently it is possible for the emergency bottle to be of the same size as the main units, due to its limited requirements, so that spares are reduced.

From these comments on the generating and storage systems it would appear that a likely solution to the location of the components would be for them to be housed in the engine nacelle, since there is often space to spare aft of the firewall for the bottles. The three bottles are interconnected by transverse balance pipes which, on 1,000 p.s.i. systems, can be quite small. This positioning of bottles eliminates the prejudice of some designers to high-pressure air storage in the fuselage. The control valves can then be conveniently located on some small panel.

At this point it may be observed that while as short a length and large a bore of pipe as practicable is desirable on the generating side, considerable weight-saving in piping can be obtained by the use on the control and actuating circuit of small-bore tubing. This applies particularly to 1,000 p.s.i. circuits, where that pressure is fed to the ram. With the reduction in pipe size the unions are correspondingly reduced in size and weight.

Criticism has been levelled at the use of high-pressure air lines in the cockpit on the grounds that if these fractured the line would whip, seriously damaging the airframe, while the noise of escaping air would alarm the passengers. Tests have shown conclusively that this criticism is quite unfounded, and that

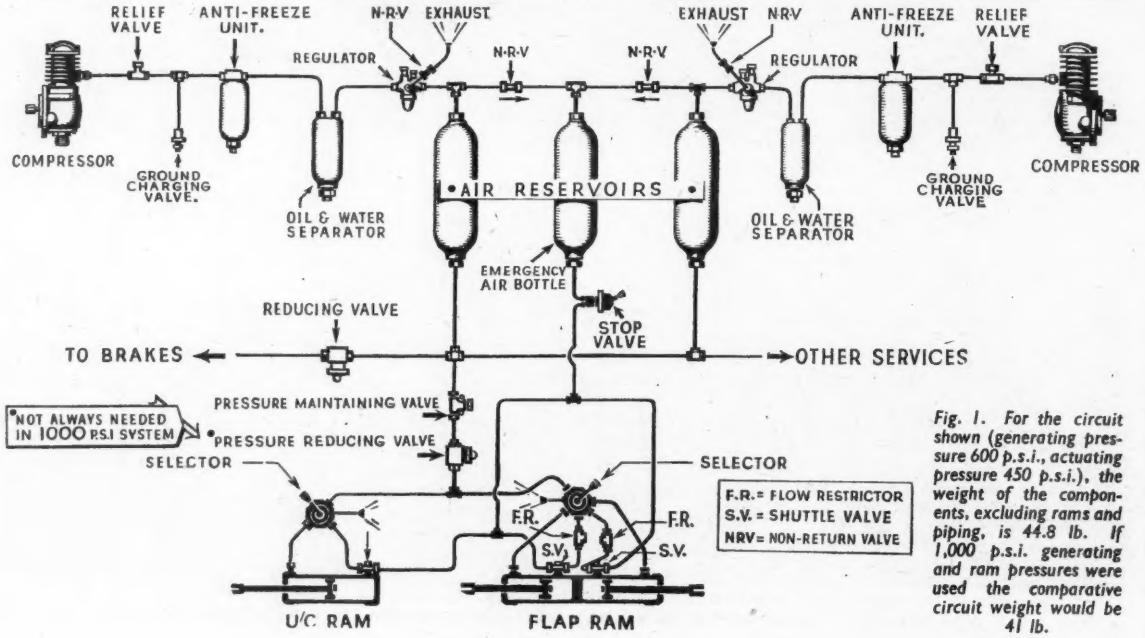


Fig. 1. For the circuit shown (generating pressure 600 p.s.i., actuating pressure 450 p.s.i.), the weight of the components, excluding rams and piping, is 44.8 lb. If 1,000 p.s.i. generating and ram pressures were used the comparative circuit weight would be 41 lb.

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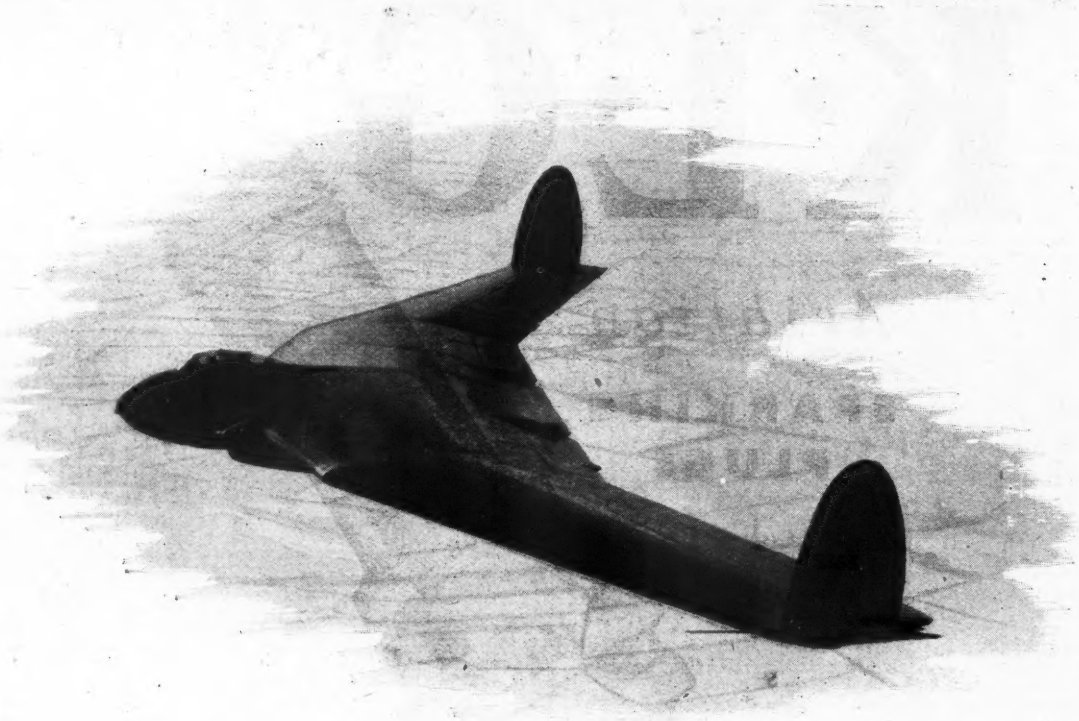

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Aircraft Pneumatics . . . . .

with the size of pipe normally in use, the fracture of a reasonably clipped pipe is a harmless local event. The pipe wall thickness of commercially available tubing, coupled with the thickness associated with practicable handling, gives a most reassuring safety factor.

While in theory the moisture content in the compressed air, small as it is after the oil and water trap, should indicate a copper-base pipe, because of corrosion on the untreated internal walls of light-alloy pipes, so far practice has shown that light-alloy pipes have a satisfactory life. Too much care cannot be expended on the piping and pipe joints of a pneumatic system, since the system's satisfactory performance can depend on the air-tightness of each joint.

The function of the pressure-maintaining valve is to isolate the actuating system if the pressure drops below brake pressure usually 220 p.s.i.—so that the air in the main air bottles is available for brakes. In this case operation of the flaps and undercarriage is effected by using the emergency air, which is taken to the rams by a separate pipe line. At the ram the emergency line is connected to a shuttle valve which, on operation by the emergency air supply, isolates the ram from the normal circuit. Thus the emergency circuit is quite separate from the normal air lines and does not rely on the safe working of any valves and pipe line which are in that circuit. The weight of the emergency air line is considered worth while in view of the additional safety which is given.

From Fig. 2 it will be seen that the emergency air is introduced to the normal system by a single shuttle valve. The saving in piping will be appreciated, but this assumes that all joints will remain leak-proof and that all items of equipment will be in perfect condition. While this supposition should be correct, it does not allow for any damage to the pipe line or to any item of equipment; it is suggested, therefore, that this arrangement to some extent negatives the installation of the emergency system. The use of a special bottle, charged at higher-than-system pressure, leads to difficulties in charging and the adoption of non-standard reducing valves. This applies equally to a small high-pressure CO_2 bottle which, at very low temperatures, suffers from a pressure reduction.

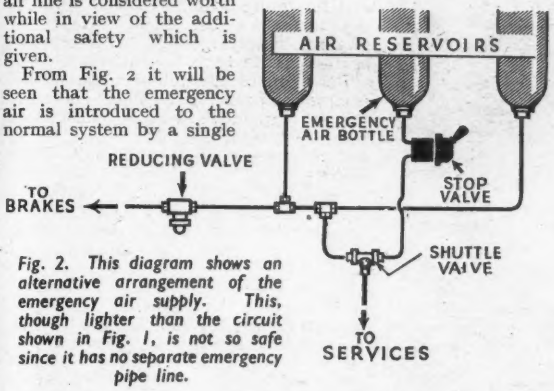


Fig. 2. This diagram shows an alternative arrangement of the emergency air supply. This, though lighter than the circuit shown in Fig. 1, is not so safe since it has no separate emergency pipe line.

Weight Saved by High Pressure

By using a 1,000 p.s.i. pressure for the generating system, and for the major load operation, the system can be by the use of a reducing valve only on the side of the ram where low-pressure air is used, as shown in Figs. 3 and 4. It will be appreciated that in this scheme the ram-pressure will fall, depending on the storage bottle capacity, but it can be arranged that the temporary minimum pressure on which the ram will work will be approximately 800 p.s.i. This means a great difference in the size of the ram, and the ram weight saving can be substantial. For instance, a flap ram having a combined stroke of 6.5in weighs 1.56 lb; the equivalent weight of a 350 p.s.i. ram is approximately 4.5 lb for a load of 1,100 lb.

In a recent layout prepared for a designer it was possible to offer the alternatives of a 600 p.s.i. and a 1,000 p.s.i. system, and for this twin-engined layout it was found that a saving of approximately 10 lb was made by using the 1,000 p.s.i. system, the system weights for components only being 38 lb and 48 lb respectively, each exclusive of brake control valves. These weights included the estimates for the rams.

Proposals put forward to another designer showed a saving compared with his estimate of the equivalent hydraulic circuit; the suggested pneumatic system weighed 38 lb, the weight given for the proposed hydraulic circuit was 72 lb. In another case the comparison with electrical actuation of flaps and tricycle undercarriage showed that pneumatics would weigh approximately 75 lb, electrics 240 lb. In this case, to individual weights of motors and control gear was added the weights of torque tubes, bearings, bevel gears and steel screw jacks; the local stiffening of the airframe for these components was not assessable.

Due to geometrical design or aerodynamic loading, it is frequently possible to arrange that the effort exerted by one side of the ram can be achieved by using air at a lower pressure whereby a saving in air consumption is effected. Fig. 4 shows how this can be arranged with existing standard components. Due to the reducing valve being in effect a non-return valve, a by-pass has to be introduced which includes a non-return valve set to pass air in the opposite direction only. This added complication unfortunately introduces yet more components and pipe joints. To simplify this layout, and to standardize a basic unit, the Hymatic Engineering Company, Limited, recently introduced a new multi-purpose valve.

New Multi-purpose Valve

This new valve is designed to give a free return flow when the selector side pressure is reduced to atmospheric, so that the non-return valve shown in Fig. 3 is unnecessary. In addition, if this property is not required, the return flow is cancelled by an alteration to the delivery union. Again, if it is a circuit where a pressure-maintaining valve is followed by a reducing valve, as in Fig. 1, then by an alteration to the inlet union, the two valves may be combined in one with an increase in weight of only approximately 0.12 lb on that of the reducing valve, giving a nett weight reduction of 0.32 lb. To this simplification must be added the weight and cost of pipe and pipe joints to appreciate fully the importance of this new valve.

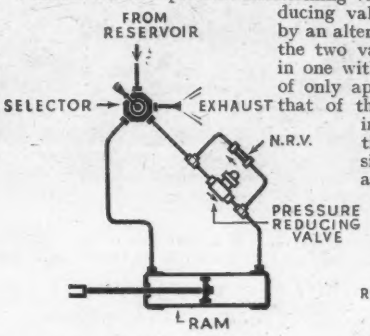


Fig. 3. Frequently it is possible to use a reduced pressure to operate one side of the ram, so employing the expansive property of air.

So far, attention has been directed to the more commonly operated units, but compressed air has been applied successfully to other services. Air-operated fuel jettison valves have been developed, using a single-acting or spring-return ram. In this application the valve is held closed by the spring acting internally on one side of the piston. To operate, air is applied to the opposite side of the piston. Spring-loaded rams are also used for various engine controls such as hot and cold air intake, air filter and idle cut-off. A typical ram for this is shown in Fig. 6 which, with a bore of 1.4in diameter and a stroke of 2in working on 450 p.s.i. has an air-operated thrust of 500 lb, while the spring-return gives an initial load of 30 lb rising to 84 lb on compression, the ram weight being 0.94 lb.

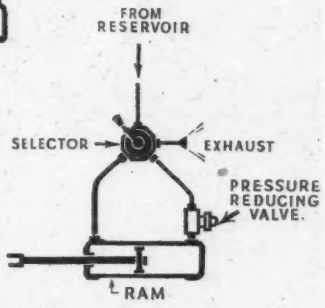


Fig. 4. By improved reducing-valve design it is now possible to delete the non-return valve shown in Fig. 3, and so simplify and lighten the circuit.

Considerable thought has been given to the development of pneumatic rams since, unlike hydraulic rams, the operating medium does not provide its own lubrication of the piston. Therefore, in developing rams which would operate satisfactorily through the complete temperature range, much research had to be done both in the composition of the rubber used for the sealing glands and in the form of grease applied to the ram during assembly, which must last the life of the ram. It will be appreciated that with compressed air the sealing difficulties are much greater than with hydraulics, since air will, at equivalent pressures, escape where hydraulic fluid apparently will not. Therefore, the rubber used must be capable of retaining its flexibility in sealing throughout the

Aircraft Pneumatics . . .

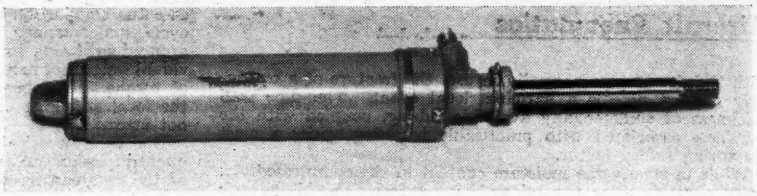


Fig. 6. A typical single-acting spring-return ram.

temperature range, particularly at the low temperatures, and in conjunction with this the lubricant must retain its properties.

A further consideration in the development of pneumatic rams is the design for efficient production. In this, the requirement for super-finish bores is of particular importance and the necessity to maintain this standard in production is a factor in the detail design of the ram. Due to the general unsuitability of steel for ram cylinders, unless specially treated, it has been found possible to make light-alloy cylinders of considerable life and low weight which do not suffer from corrosion that would otherwise occur due to the moisture content in the compressed air. This does not mean, however, that steel will not have to be reconsidered when much higher pressures are reached in aircraft pneumatics for economical design, both for weight and manufacture.

Pneumatically operated engine-priming equipment has been developed and has proved rapid and positive in action. The equipment consists of a control button in the cockpit connected by a single pipe line to a pump on the engine. In the design the two units, which are functionally inter-dependent, are so arranged that, once the push button is pressed, the priming cycle is completed automatically. The operator cannot misunderstand or hurry the cycle, and for engines of approximately 275 h.p. the number of priming cycles is approximately four. 500 h.p. is the maximum for which the pump was suitable. The combined weight of the two units is 1 lb.

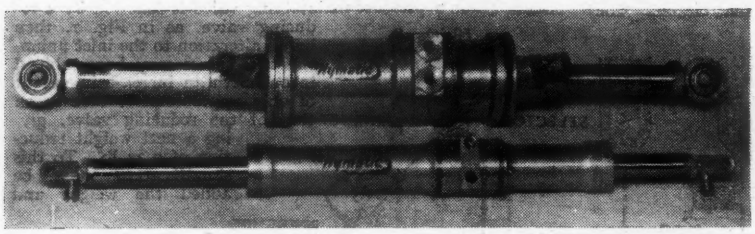


Fig. 5. This shows comparative rams of almost equivalent stroke for 350 p.s.i. and 1,000 p.s.i. operating loads, the higher pressure ram being, of course, the smaller diameter.

So far as the writer is aware, pneumatically operated windscreen wipers absorb more air than the compressors can supply continually, but further development of this component is under way in more than one quarter.

Sealing Aircraft Doors

For the sealing of pressure-cabin aircraft doors, low-pressure air at about 5-15 p.s.i. is introduced to a sealing bag located in the door-frame thickness which, when the door is closed, inflates to provide an airtight seal. The amount of air used per cycle is extremely small.

This door-sealing application actually is a first step towards the most interesting problem of reducing the drag of very high speed aircraft, where it would seem logical to seal all openings in the skin and cowls through which air might be sucked or forced by the aircraft's passage through the air. The air movement indicates in effect a loss of power which will amount possibly to serious proportions at the increasingly higher speeds being attained and forecast. The amount of air used for quite a large aircraft would be small, the control gear amounting to one reducing valve and the number of selector valves depending on the convenience of the operator.

From this it will be seen that pneumatics can offer, on the aircraft for which they are suitable, important weight-saving as an auxiliary power supply. The unsuitability of pneumatics for the larger aircraft has been limited by the output of the compressor and the storage capacity needed by the relatively low pressure available.

These limitations have been reflected in the ram size which, by their dimensions, have determined the size of the undercarriage to which they can be applied. Thus to open up a larger field for aircraft pneumatics, it has been necessary to increase the compressor output at the highest practicable pressure. This advance was made possible by taking advantage of the development of gas-turbine engines. With these engines it is possible to bleed from the turbine compressor volute a relatively small amount of air, at ground level with pressure up to 50 p.s.i., and feed this to the modified pneumatic circuit compressor. In this way a much larger volume of high-pressure air is made available for the pneumatic system, the increased volume of 1,000 p.s.i. air being up to approximately six times that supplied by a normally aspirated engine.

With this increased volume of air and by a suitable selection of air storage capacity, it is possible to operate the undercarriage and services of much larger aircraft while still providing a competitive weight in comparison with hydraulics or electrics. So far an approximation of the limiting aircraft gross weight has not been assessed, but as a matter of interest it was estimated that for a 100-ton flying boat with flaps and retracting floats, from the information available, four supercharged compressors, supplying sixteen 1,000 cu in bottles, would have been adequate.

For high-altitude military aircraft this compressor opens up an increased number of applications for pneumatics because of its exceptional performance at and about 40,000ft. Supplying air at 1,000 p.s.i. at the altitudes in a greater volume than a normally aspirated compressor at sea level, it is possible to introduce pneumatics to operate bomb-doors, colour screens and other high-altitude services.

It is felt, therefore, that a very useful field exists for aircraft pneumatics in their present state of development, and due to the introduction of the supercharged compressor, a further expansion, as yet little exploited, is presented. The increase in the range of gas turbines to relatively small sizes has a further effect on the applications of this new compressor. With regard to compressors developing higher pressures directly comparable with modern hydraulics, it is felt that some years may pass before they can be offered with a full range of equipment to the aircraft industry. In the meantime, improvements in present equipment will enhance further the range which, in so short a time, has made so favourable an impression on the aircraft industry.

THE R.Ae.S. RECEPTIONS

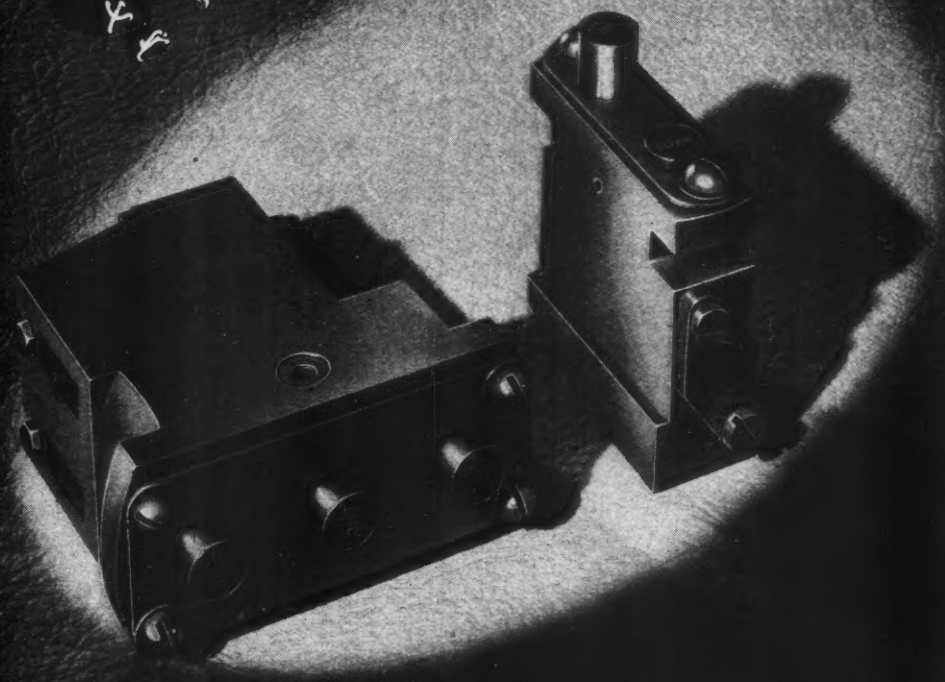
READERS are reminded of the two receptions to be held at the Royal Aeronautical Society on January 17th and 24th. The president, Dr. H. Roxbee Cox, and Mrs. Roxbee Cox will receive the guests, and many of the most interesting items from among the Society's rare books and prints, including some from the Hodgson-Cuthbert Collection, will be on view. Tea will be provided for members and their friends (each member may bring up to three friends). The reception begins at 3 p.m. and tickets are 4s each.

The collection was begun by Mr. John Cuthbert in 1820, acquired by Mr. J. E. Hodgson, honorary librarian of the Society, in 1917, and now bought and presented to the Society by Sir Frederick Handley Page.

G. H. CHALLENGER

MANY of our older readers in the British aircraft industry will remember Mr. George H. Challenger, who died recently at the age of 66. He began his aeronautical career with the Bristol Aeroplane Co. when it was founded by Sir George White under the title the British and Colonial Aeroplane Co., Ltd. He transferred to Vickers in about 1913, when the aviation department was under Major Wood, and was there contemporary with such pioneers as Mr. A. R. Low and Mr. Howard-Flanders. He resigned from Vickers in 1918, having taken part in designing the many different aircraft types produced during the first world war. George Henry Challenger was an upright man who brought his religious convictions into everyday life.

MESSIER



PRESS BUTTON SELECTORS

These midget selectors enable 4,000 lb. sq. in. hydraulic systems to be controlled by extremely light finger effort. The two button three way unit weighs 0.35 lb.; the three button unit, with fully interlocked buttons, is suitable for flap systems and weigns 0.45 lb. Both units use 1/8th or 3/16th inch piping.

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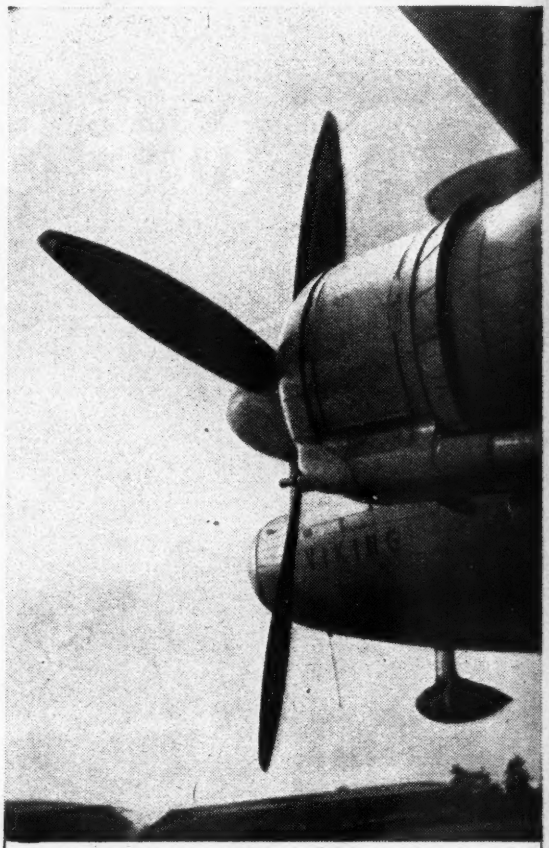

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Search and Rescue

Extended Duties of New S.R. Organization

NOTICE to Airmen No. 270 of the year 1947 laid down that Area Controls serving Flight Information Regions should be responsible for alerting Search and Rescue services for aircraft known to be in distress. The Search and Rescue Organization of the Royal Air Force is the branch formerly known as Air-Sea Rescue, which, since its formation in 1941 until the end of the war, saved about 11,000 airmen, sailors, soldiers and civilians. Now its responsibilities are extended to embrace civil, as well as military, aircraft.

The present organization was planned by the Air Ministry and the Admiralty, and relies primarily on R.A.F. and Naval facilities, though valuable assistance is available from other sources. The areas covered by the new agreement extend throughout the United Kingdom and in those territories overseas in which the Royal Air Force has facilities. Liaison is maintained within the organization with the Admiralty, the National Lifeboat Institution and other bodies concerned in sea or land rescue. In a wider field contact is maintained with I.C.A.O., which will in future receive from the Air Ministry for publication such information on search and rescue as is not secret. When an aircraft is reported missing, or crashes in an area administered from the United Kingdom, all available data which might assist the Search and Rescue Organization will be passed by the Air Traffic Control Centre to the appropriate Rescue Co-ordination Centre of the R.A.F. When an aircraft is missing an air search over the route it was following is to be made, with due allowance for deviations which might have been caused by weather or other factors. Broadcasts to shipping will ensure watch on the sea lanes and the assistance of the B.B.C. and the Press is being sought in asking the public to report facts which might assist in the land search. In cases where an aircraft is found to have crashed at sea, aircraft carrying airborne lifeboats will be sent to its aid, together with launches, lifeboats or shipping. For land crashes search parties and mountain rescue units will be available, and helicopters will be used where conditions are appropriate.

From January to September, 1947, the Search and Rescue Organization went into action 25 times to assist aircraft, and four times to aid shipping. Ninety-one people were saved. These figures do not by any means represent the number of calls made on the organization, the average number of which is 12 a month. A high proportion of these are found after checking to have been caused by pilots failing to report a safe landing.

"AIRCRAFT PHOTOGRAPHY"

DESCRIBING himself as the "oldest inhabitant," Mr. John Yoxall, Art Editor of *Flight* and doyen of air-to-air photographers, gave an extremely interesting, as well as an amusing lecture, which was illustrated by lantern slides, to the Derby branch of the Royal Aeronautical Society, in the Rolls-Royce Welfare Hall, Derby, on Monday, January 5th.

In his own inimitable way and with many amusing anecdotes, Mr. Yoxall described how the technique of aircraft photography had developed since the earliest days of flying. The showing of each slide was accompanied by some interesting reminiscence of flying in its more primitive days. The account of the unassisted ascent of the 120ft mooring mast (rate of climb was not disclosed) in order to enter the R.36 airship being very amusing, particularly the story of the passengers on board ship being warned not to gather in groups of more than three or they might go through.

Altogether it was a very pleasant lecture and it can genuinely be said that a good time was had by all. Col. L. F. R. Fell, of Rolls-Royce, introduced the speaker, and S/L. Jim Heyworth, a Rolls-Royce test pilot, proposed a vote of thanks.

A. I. F.

New Year Honours

(*Concluded from page 45.*)

M.B.E. (Civil)

Harry Lager, M.M., Senior Staff Officer, Air Ministry; Frank Dixon Marshall, Honorary Secretary, Yorkshire Air Training Corps Association; Alderman Douglas Archibald Alfred Merry, Chairman, Finchley Local Committee of Nos. 393 and 1825 Squadrons, Air Training Corps; George Frederick Tyler, F.C.I.I., Chairman, Ilford Wing Committee, Air Training Corps.

Sir Frank Spencer Spriggs, Managing Director, Hawker Siddeley, who received his promotion in the Order to K.B.E.

NEW ZEALAND LIST

ORDER OF THE BRITISH EMPIRE

C.B.E. (Military)

Group Capt. C. E. Kay, R.N.Z.A.F.

INDIA OFFICE LIST

ORDER OF THE BRITISH EMPIRE

O.B.E. (Civil)

John Parkyn Jeffcock, M.I.E.E., Deputy Director-General, Civil Aviation (Airways and Administration), Government of India.

M.B.E.

John Hamilton, Director of Administration, Civil Aviation Department, Government of India.

ROYAL AIR FORCE AWARDS

BAR TO AIR FORCE CROSS

Act. Wing Cdr. R. C. E. Scott; Sqn. Ldrs. M. C. Adderley, M. D. Lyne.

AIR FORCE CROSS

Wing Cdrs. A. E. Dale, R. I. Jones; Act. Wing Cdr. J. R. Baldwin; Sqn. Ldr. I. R. Campbell, J. S. Higgins, E. James, E. F. Thornicroft; Act. Sqn. Ldrs. F. J. Cable, A. D. G. Stephenson; Flt. Lts. J. F. M. Bevan, R. T. Bowring, W. Foster, W. Gallagher, W. F. Hoffmann, C. J. Homes, C. F. Kirkwood-Hackett, A. Lloyd, J. E. Major, T. H. Meyer, J. H. Pinckard, F. N. Ramsey, J. E. L. Rivalant, D. A. Shaw, N. C. Thorne, R. V. Y. Walmsley; Lts. S. G. Orr, E. M. Welch, R.N.; Act. Flt. Lt. S. J. Hubbard; F/O. G. H. Carter, G. Jukes, W. J. O. Morrison, P. Rowland, Act. W/O. D. S. Campbell.

AIR FORCE MEDAL

Navigator II G. J. H. Mewis; Engineer II J. B. Elder.

BAR TO ROYAL RED CROSS (First Class)

Matron Catherine Walker, R.R.C., P.M.R.A.F.N.S.

ROYAL RED CROSS (Second Class)

Acting Matron Millicent Clare Rattenberry, P.M.R.A.F.N.S.

King's Commendation for Valuable Service in the Air

Sqn. Ldr. R. R. Jeffery; Flt. Lts. E. L. Drake, D.F.C.; H. T. Lerry; H. W. Taylor, D.F.C.; F/Os. D. E. Edney, A. G. Henderson, R. I. Sneddon; Pilots II W. H. Atkins, N. W. Davey; Navigator H. C. McClelland; Signaller II D. A. Birchall; Engineers II A. S. Shoebottom, A. S. Simpson.

ROYAL AUSTRALIAN AIR FORCE AWARDS

AIR FORCE CROSS

Sqn. Ldr. C. W. Stark; Flt. Lts. J. G. Cornish, D. R. Hebbard, A. J. Somerville, A. Starkey, G. Tuck.

King's Commendations for Valuable Service in the Air

Wing Cdr. G. D. Marshall; Flt. Lts. J. P Graney, J. C. Green, E. W. Guy.

King's Commendation for Brave Conduct

Flt. Lt. F. W. Gregory.

BRITISH EMPIRE MEDAL (Military)

Air Artificer Third Class K. J. Russell. Air Artificer Third Class H. J. P. Barty.

F/Sgts. J. Adam, J. K. Archer, H. W. Cooper, M. Crawford, R. M. Daniel, R. Fleming, S. B. Greet, J. Hartley, C. A. F. Kettle, S. Leonard, H. Norster, J. C. Payne, J. W. Smallfield, A. T. Summers, R. Travers, G E. Trott, J. Turvey; Sgts. R. C. Callow, L. L. Cobbin, B. L. Cosh, V. G. Frost, S. C. Nurse, J. C. Percival; Act. Sgt. T. Stockbridge; Cpl. T. E. J. Harrison; Act. Cpl. M Hunt; Sgt. M. Blaney, W.A.A.F.; Sgt M. E. Campbell, W.A.A.F.; Sgt. N. Smith, W.A.A.F.; Cpl. G. M. Hindes, W.A.A.F.

(Civil)

P. Lancaster, Clerk of Works, R.A.F. Base, Singapore; S. C. Peach, Chargehand Telephone Operator, R.A.F. Station, Cranwell; A. Rickards, Senior Examiner, Aeronautical Inspection Directorate, Ministry of Supply; W. R. E. Satchell, Instructor of Engineers, British Overseas Airways Corporation; H. Saunders, Instructor, Grade 1, No. 1 School of Technical Training, R.A.F., Halton, Aylesbury; R. Walker, Foreman, Royal Aircraft Establishment, Farnborough; J. A. Wallace, M.M., Warrant Officer, No. 367 (City of Sheffield) Squadron, Air Training Corps. B. I. Lynch, Ground Fitter, Martin Baker Aircraft Co., Ltd., Middlesex. H. S. Sharp, Shop Foreman, No. 4 Maintenance Unit, R.A.F., Ruislip.

King's Commendation for Valuable Service in the Air

Capt. C. E. Madge, Senior Captain, British Overseas Airways Corporation.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE COST OF FLYING

A Private Owner Reveals His Expenses

I NOTICE that there has been considerable speculation during recent months as to the lowest possible cost of owning and maintaining a light aircraft for private use.

Having been the owner of a Piper Cub J3C for just over 12 months, may I venture to add another stone to the pile by submitting a few figures for comparison, being a brief summary of my aviation expenses for the past year.

	£ s d	£ s d
Loss of income due to original capital outlay of £650 (calculated at a yield of 2½%) ..	16 5 0	
Less income tax @ 9s	7 6 3	
	£8 18 9	8 18 9
Insurance (7% of total value of a/c.) ..		43 1 0
Hangarage (local airport) @ 2s 6d day ..		26 5 0
Ditto (other airports)		9 6 0
Landing fees		4 8 0
Landing card (State controlled)		5 0 0
Customs carnet		5 0 0
73 octane petrol (521 gallons)		55 7 7
80 octane petrol (124 litres) .. .. .. (picked up on carnet)		5 11 0
Servicing aircraft (including 3 50-hr inspections		19 17 6
Work done on aircraft prior to renewal of C. of A.		13 8 9
Subscription to local aero club		4 5 0
Ditto to R.Ae.C.		2 2 0
Miscellaneous (telephone calls, Customs' fees, etc.)		2 11 9
Total		£205 1 3

I should mention that the aircraft is a standard Piper Cub J3C, having completed 15 hours flying when acquired from the U.S. Army, and is normally picketed-out on an ex-U.S.A.A.F. strip conveniently situated at the bottom of the garden; though this has only been done during the summer months, hence the substantial hangarage fee from the local airport, where shelter is also obtained during gale warnings, etc.

The landing fees are somewhat higher than might be expected, chiefly owing to the lack of a State-controlled landing card during the first part of the year, though this has almost paid for itself since: 45 different airfields having been used (14 State-controlled, 11 club, 10 Service, 5 foreign, and 5 private), apart from countless beaches and small fields (when attending shooting parties, bathing and, on one occasion, a cocktail party!).

The total number of hours flown in this aircraft during the year was 169, at which figure the net cost of operation works out at £1 6s 3d per hour; though the purchase of a larger aircraft during September considerably reduced the flying done in the Cub during the last three months, which would otherwise have completed a further 40 or 50 hours.

I might add that these expenses are borne entirely out of my own pocket and not "clawed back" from E.P.T. on a company balance sheet. G. REID-WALKER.

WOMEN PILOTS

Safe Flying Only Taught by Experience

I AM glad to read the challenge of Messrs d'Erlanger, Wills, and Bathurst (*Flight*, January 1st), but am a little surprised to hear that they are not concerned to argue the respective merits of men and women pilots, in view of the four-paragraph letter demonstrating to the contrary. Nevertheless, like the remainder of the dissentients, they stray some way from the original point in L. Heather's letter, namely, that women's work in A.T.A. could have been done more efficiently by ex-R.A.F. personnel. With this I agreed, and agree, on the assumption of the statement implying that, had their work been originally organized from ex-R.A.F. personnel, it would have been done more efficiently. I think that is correct? However, I enlarged on it a little more by writing from personal experience, not only in A.T.A. but also in the R.A.F., in the late war, and am consequently in a sound position to judge.

During the course of the correspondence a great deal of acrimony has crept in, totally opposed to the particular issue and distorting the meaning of the very normal word "inefficiency" into a meaning entirely in the imagination of the writers, with no justification at all. Added to this, a supposed complete answer comes from three gentlemen who base their argument (?) on statistics alone which, as all the world knows, can be made to prove anything, and I hasten to contradict their claim that flying details reported to them were *all* accurate.

Specialized training, sadly enough, does not teach experience, and it is only experience that teaches safe flying; staying on the ground on some bad-weather days *can* have been due to lack of experience, only another way of saying "lack of efficiency," and this was the whole point of my agreement with L. Heather's letter.

Incidentally, it is an indisputable fact that A.T.A. work was a paradise compared with R.A.F. life-in-general, and any work of that paradisical nature should be the prerogative of the men who have once chosen to serve their country operationally. F. S. SYMONDSON.

Main Point Missed

ALL your correspondents who have replied to my letter published in *Flight* of November 6th, 1947, appear to have missed the main point, viz., why create a W.A.A.F. Reserve for flying duties, etc., when there are plenty of men available?

It is just 44 years since the first power-driven aircraft flew. So far as invention is concerned women have not contributed one atom. Therefore men should be given first chance in aviation, whether military or civil. L. HEATHER.

[*This Correspondence must now cease.—Ed.*]

AIR TRAVEL

The Importance of Good Food

I ENTIRELY agree with the views expressed by Mr. W. van Leer in *Flight* of January 1st. As a matter of interest, a very good friend of mine (he served as a pilot in the R.A.F. during the war) now travels four to six times a year between the U.S. and the Continent. He tried B.O.A.C., the American Lines and Air France. He now concentrates on Air France, saying "Constellation for Constellation, I prefer the ones with the best food!" C. S.

FORTHCOMING EVENTS

Jan. 15th.—Royal Aeronautical Society: Joint lecture with the Institute of Fuel. "Gas Turbine Accessory Systems." O. N. Lawrence, A.F.R.Ae.S.
Jan. 15th.—R.Ae.S. (Gloucester and Cheltenham): Film on Rocket Flight.
Jan. 16th.—Institute of Navigation: "Grid Navigation and its Allied Problems," S/L. R. H. Blackmore.
Jan. 17th.—Royal Aeronautical Society Reception at No. 4, Hamilton Place.
Jan. 20th.—R.Ae.S. (Bristol). Debate.
Jan. 20th.—R.Ae.S. (Graduates and Students) Helicopter Films. Commentary by Captain Cyril Turner, A.F.C.
Jan. 24th.—Royal Aeronautical Society Reception at No. 4, Hamilton Place
Jan. 24th.—Helicopter Association of Gt. Britain: Lecture by H. M. Yeatman, M.A., A.F.R.Ae.S. postponed. Instead, "American Helicopter Development", by Maj. J. C. Siltanen, U.S.A.A.F.
Jan. 28th.—Royal United Service Institution: "Resistance Movements in War." Maj. Gen. Sir Colin Gubbins, K.C.M.G., D.S.O., M.C.
Jan. 29th.—R.Ae.S. (Manchester): "Pressurization." G. Beardshall.
Jan. 29th.—R.Ae.S. (Preston): "Photographic Interpretation of Bomber Offensive Against Germany." S/Ldr. G. A. Morris, O.B.E.
Jan. 29th.—Royal Aeronautical Society: "Flight Testing of Helicopters." W. Stewart, B.Sc.
Feb. 3rd.—R.Ae.S. (Belfast): "High-Speed Flight." Dr. Hilton.
Feb. 4th.—R.Ae.S. (Gloucester and Cheltenham): "Air Operations in the Battle of Britain."
Feb. 4th.—R.Ae.S. (Luton): "Some Problems in Civil Aviation." N. E. Rowe, C.B.E., B.Sc., D.I.C., F.R.Ae.S.
Feb. 4th.—R.Ae.S. (Southampton): "Structure Testing." P. B. Walker, M.A., Ph.D., F.R.Ae.S.
Feb. 6th.—Institute of Navigation: "A New System of Compass Correction." Dr. G. N. Harvey, O.B.E.
Feb. 10th.—R.Ae.S. (Graduates and Students): "Stability and Control Problems." D. J. Lyons.
Feb. 12th.—Royal Aeronautical Society: "The Aerodynamics of the Gas Turbine." A. R. Howell.
Feb. 18th.—Royal United Service Institution: "The Strategic Offensive Against Germany." Air Chief Marshal Sir Norman Bottomley, K.C.B., C.I.E., D.S.O., A.F.C.

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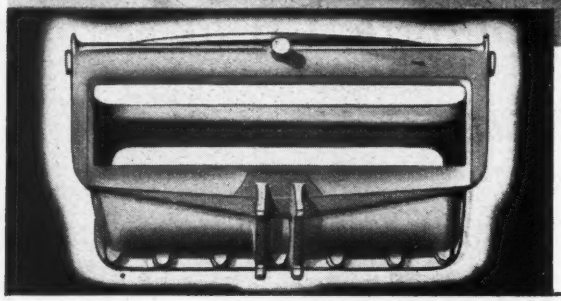

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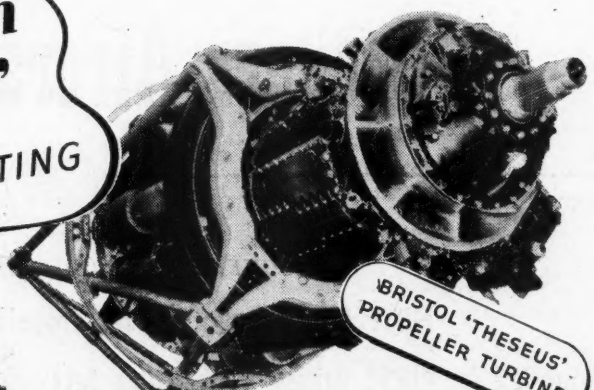

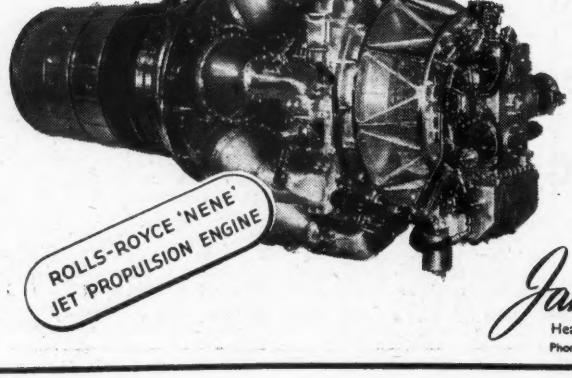

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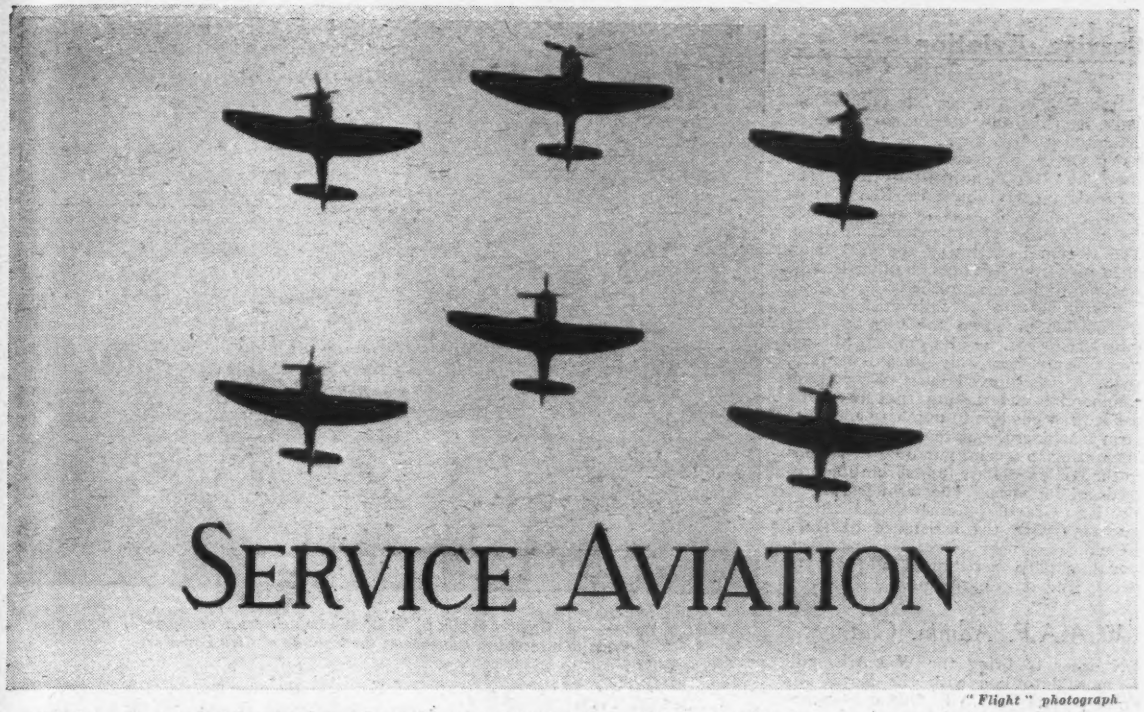


SERVICE AVIATION

"Flight" photograph

STRAFERS: Tempest II fighter-bombers (Centaurus) of a B.A.F.O. Wing. This mark of Tempest may eventually be succeeded by a variant of the Vampire.

Award

THE KING has been graciously pleased to approve the following award:—

Distinguished Flying Medal.

Flight Sergeant S. D. Greaves, Royal Air Force Volunteer Reserve, No. 35 Squadron.

Flt. Sgt. Greaves served as a pilot with Nos. 58 and 35 Squadrons from October, 1940, until July, 1941, when he was taken prisoner after being forced to abandon his aircraft near La Pallice. On July 24th, 1941, he was captain of an aircraft which formed part of a force detailed to attack the enemy battleship *Scharnhorst* at La Pallice. During the run-up to the target, very heavy anti-aircraft fire was encountered and Flt. Sgt. Greaves's aircraft was repeatedly attacked by enemy fighters. In spite of this the attack was successfully pressed home and the bomb aimer has stated that the "target was very steady in the sight when the bombs were released." During the approach to the target the rear gunner claims to have shot down one enemy aircraft and to have badly damaged another. One direct hit which has been accredited to Flt. Sgt. Greaves was registered on the *Scharnhorst* during the attack. After the bombs had been dropped, the aircraft was subject to further attacks by enemy fighters and was hit several times. Four members of the crew were wounded and three of the engines were set on fire. Shortly afterwards, Flt. Sgt. Greaves gave orders to abandon the aircraft, which exploded.

R.N. & R.A.F. Boxing in Denmark

THE following have been selected to represent the Royal Navy and Royal Air Force *versus* the Sparta Club of Denmark, in Copenhagen to-morrow: *Light Heavy*, Leading Stoker Bird (Plymouth); *Middle*, Marine J. Rice (Plymouth); *Welter*, Able Seaman J. Urquhart (Portsmouth); *Light*, Aircraftman R. Bruzas, R.A.F.; *Feather* (1st string), Aircraftman P. Lewis, R.A.F.; *Feather* (2nd string), Leading Aircraftman T. Proffit, R.A.F. *Bantam*, Sick Berth Attendant J. Mowbray (Nore); *Fly*, Corporal L. Daw, R.A.F.

Also required to box if air passage is available are: *Middle*, Aircraftman G. Hazel, R.A.F.; *Welter*, Stoker M. Rattray (Nore).

Boxing will be under Danish Amateur Rules.

Royal Air Force and Naval Aviation News and Announcements

R.A.F. Food Production

THE Minister of Agriculture — the Rt. Hon. Tom Williams, M.P. — visited R.A.F. Station, Lindholme, near Doncaster, on January 4th and saw for himself the produce and live stock on a model farm at the station. The visit followed an invitation to the Minister by Mr. Geoffrey de Freitas, M.P., Under-Secretary of State for Air, when both attended the R.A.F. Horticultural Show in London last October. Mr. Williams was then told that during 1946 the R.A.F. produced from 2,254 acres, 4,808 tons of vegetables of a total value of £83,883, as well as cereals valued at £707. Other units kept live stock—pigs, rabbits and poultry—which, in 1946, produced meat and eggs valued at £10,427.

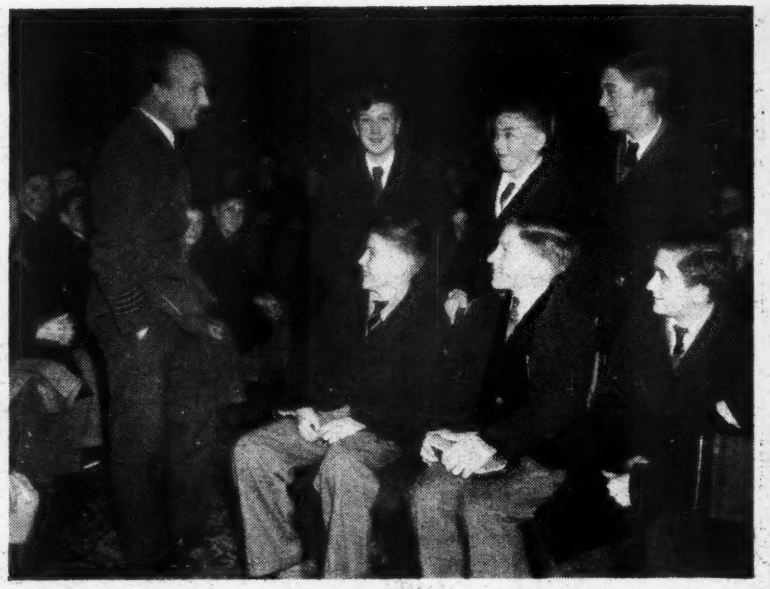
Lindholme, although not the largest

DEPARTURE FROM NORTHOLT: Mr. Arthur Henderson is seen leaving the Transport Command building at Northolt for India on December 30th. With him, l. to r., are Air Marshal Sir Brian Baker and Group Captain I. Hodgson.

Service Aviation . . . . .

of the R.A.F. "farms," is notable because it is the only station ever to have exhibited at the Royal Show. Two of its pedigree pigs entered in the last show, at Lincoln, both won prizes. The station's piggery, built by R.A.F. personnel, houses a herd of prize Wessex Saddlebacks at present valued at £800. The station has, during the year, supplied pigs from this herd to other R.A.F. stations and farmers to the value of £500.

Forty-one acres of cultivated land on the station produced 100 tons of vegetables last year, besides grain. Although the "farm" was only started in July, 1946, it has proved such a successful commercial undertaking that not only has it been possible to purchase adequate farm machinery, but to contribute sums amounting to several hundreds of pounds to the station welfare funds from the proceeds of its sales. The farm is run by Mr. Eric Graville—former R.A.F. flight sergeant—with the assistance of three permanent airmen volunteers and occasional outside assistance in times of potato and crop gathering.



THERE I WAS——: Group Captain E. M. Donaldson delivers a discourse on high-speed flying to a receptive audience at the Institute of Civil Engineers.

W.A.A.F. Admin. Changes

IN order to bring the W.A.A.F. still more into line with the Royal Air Force certain W.A.A.F. Officer branches are being renamed. This change is only for convenience of administration and does not affect existing conditions of service.

The present Administrative and Special Duties Branch and the Accountant Branch will, like their Royal Air Force counterparts, be called the Secretarial Branch, and the Catering and Provost branches will become independent. A new Education branch has also been set up for those W.A.A.F. officers who were employed on education duties and previously belonged to various branches.

Seven New A.D.Us.

OPPORTUNITIES for part-time service for men and women will soon be available at the following seven new Air Defence Units of the Royal Auxiliary Air Force which are about to form and which are scheduled to begin recruiting early this year: No. 3507 (County of Somerset), at Rudloe Manor, Box, Chippenham; No. 3509 (County of Staffordshire), at Trentham Institute, Trentham, Stoke-on-Trent; No. 3602 (City of Glasgow), at R.A.F. Bishopbriggs, Glasgow; No. 3603 (City of Edinburgh), at R.A.F. Barnton Quarry, Edinburgh; No. 3608 (North Riding), at R.A.F. Thornaby-on-Tees, Yorks; No. 3611 (West Lancashire), at R.A.F. Fazackerley, Liverpool; No. 3614 (County of Glamorgan), at R.A.F. Llandaff, Cardiff.

There will be particular scope for volunteers in plotting, radar and wireless, and vacancies will be available in most other trades, such as clerks, cooks, drivers and administration. Full details of how to join locally will be issued as soon as recruiting begins. Any enquiries at this stage, however, should not be addressed to the unit concerned, but to Headquarters, Reserve Command, Royal Air Force, White Waltham, Berks. When the seven new A.D.Us. begin operation there will be a total of 16 in various parts of the country.

SAUCER, FLYING, Mk. IV: Mr. Tom Williams, M.P., Minister of Agriculture, who, as related on this page, recently visited Lindholme, is seen inspecting a flying saucer stated to have been shot down at the station last year. On the left is W/C. G. K. Buckingham, D.F.C., and on the right F/L. D. J. G. Dunbar and G/C. J. C. Sisson, D.F.C., Officer Commanding Lindholme.*

Reunions

IT is proposed to hold a reunion of staff officers who served at No. 4 Group Headquarters during the time the Group formed part of Bomber Command. Air Marshal Sir Roderick Carr has given his blessing to the project and hopes to be present at the reunion some time in March or April. Will former 4 Group officers please contact ex-Squadron Leader A. G. Edwards at 23, City Road, London, E.C.1.

* * *

For this year's Lyneham Reunion the president, G/C. Walter J. Pickard, O.B.E., has specially booked the Paramount dance hall in Tottenham Court Road, London, where the reunion and guest night for friends of Lyneham will be held on February 3rd from 8 p.m. to 1 a.m. Members are asked to invite as many friends as possible, and it is pointed out that two first-class dance bands have been engaged, and there will be a Cabaret. Tables may be reserved and tickets booked (12/6 single, 21/0 double) from the Hon. Sec., S/L. J. W. Hicks, 76, Southwark Street, London, S.E.1. Price of tickets includes buffet supper, but drinks are extra. The bars are fully licensed.

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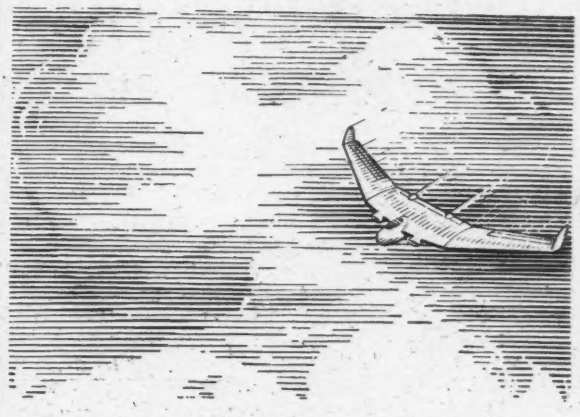

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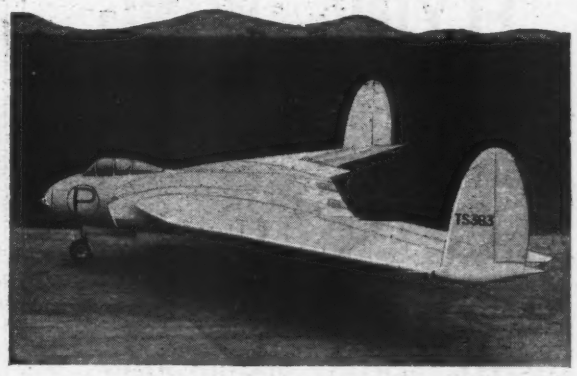

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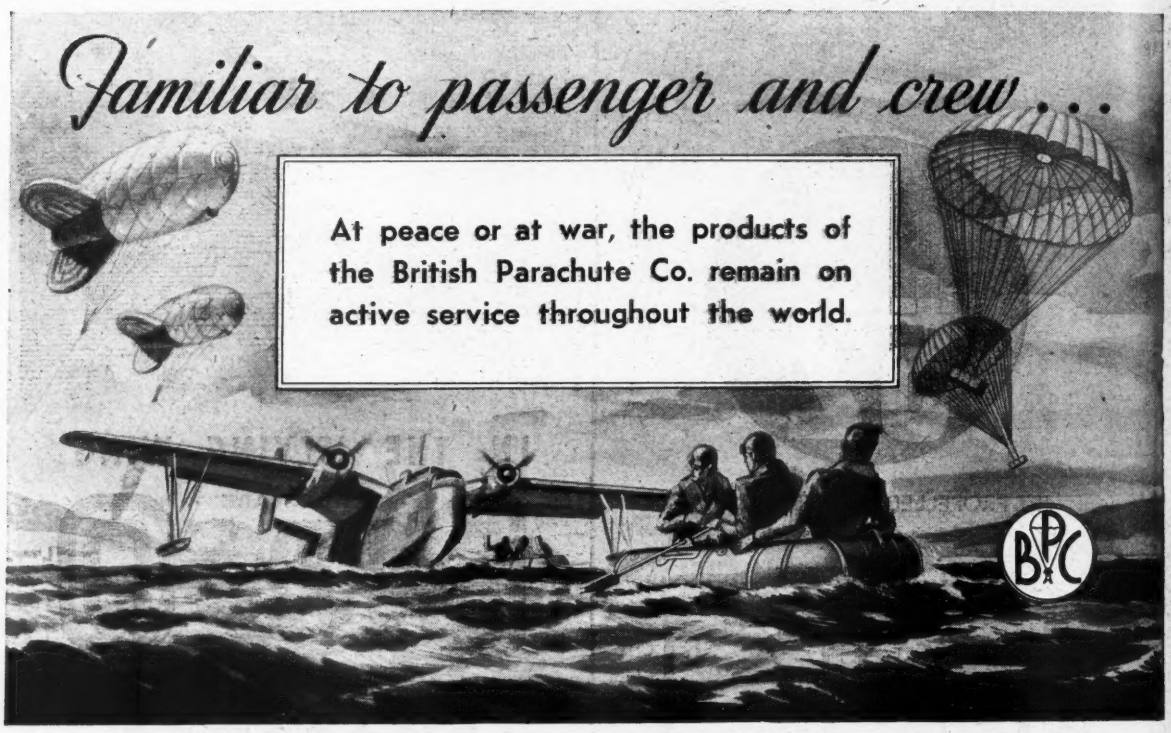

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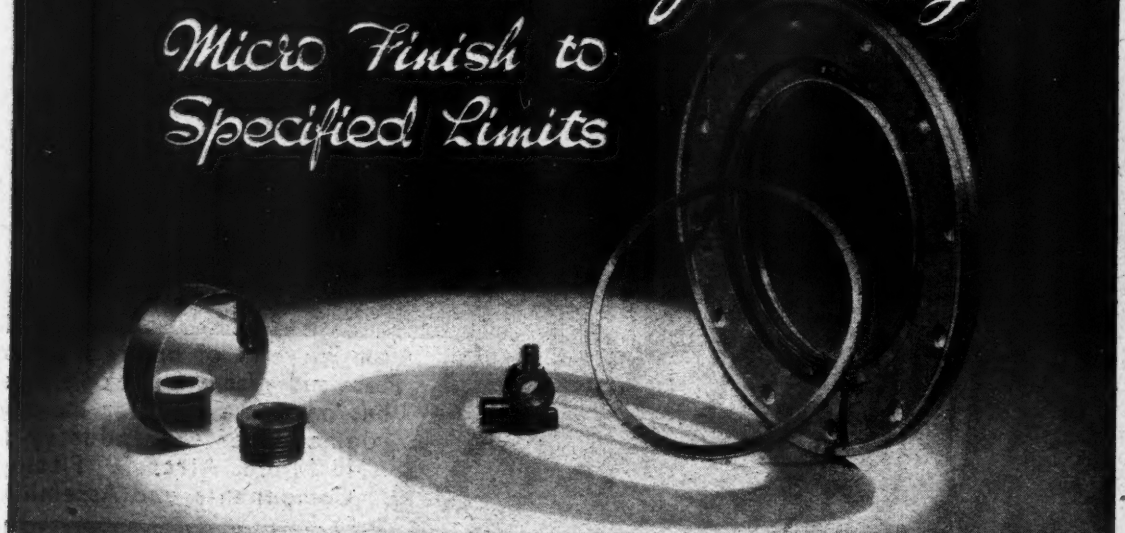

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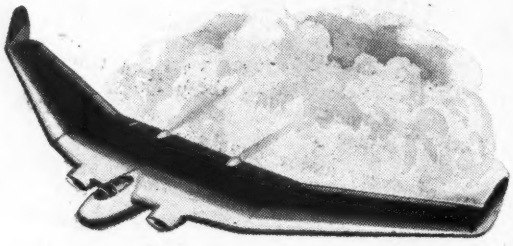

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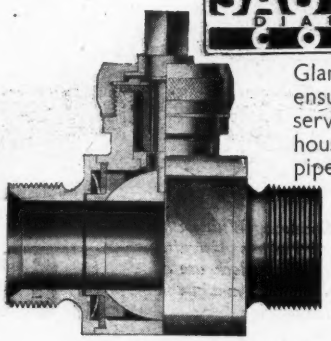

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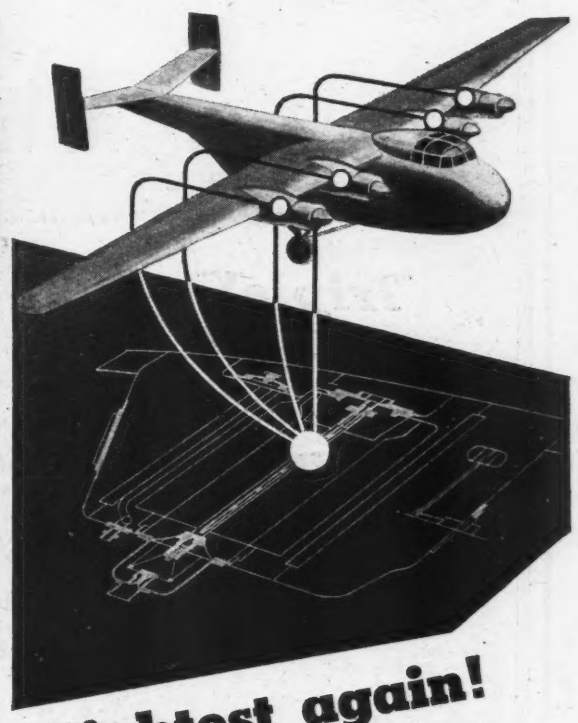

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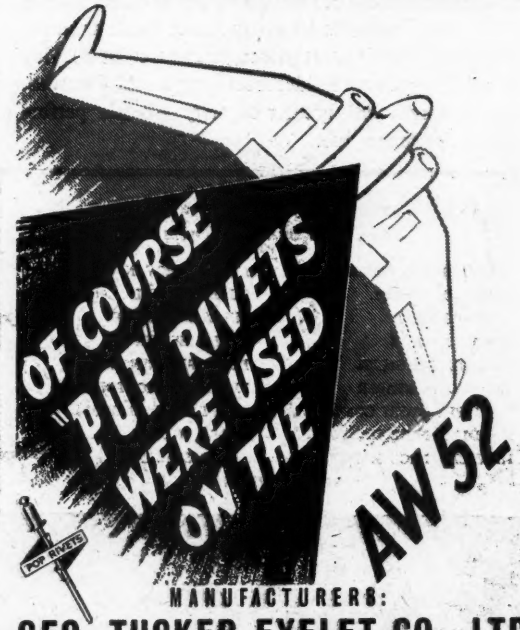

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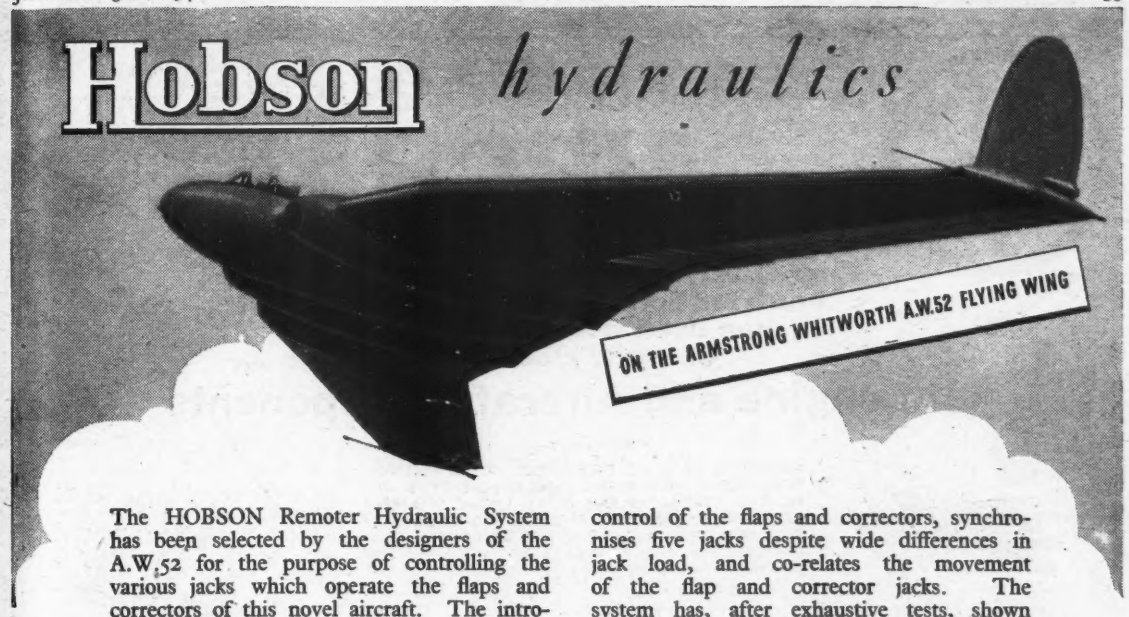

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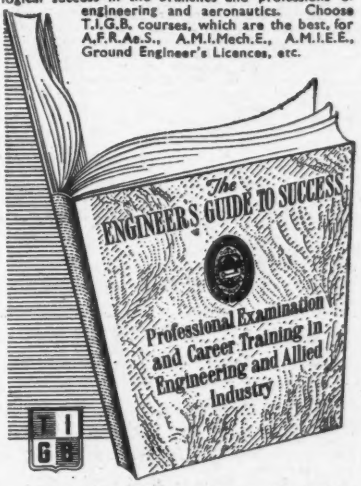
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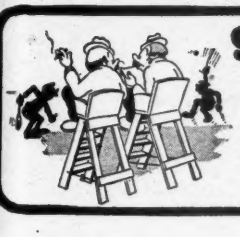

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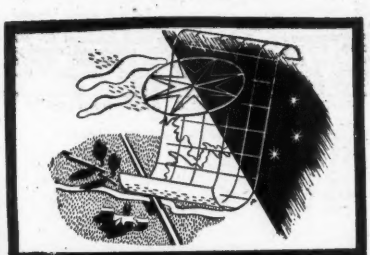

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PRIVATE and personal tuition service for all classes of pilots and navigators licences, London area day or evening.—Write for details to Stocks, 252, Old Lodge Lane, Purley, Surrey, or Phone Uplands 1278. [1272

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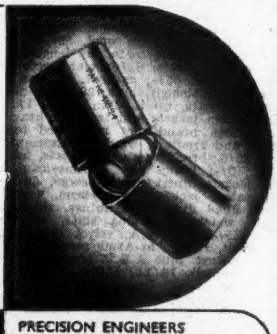

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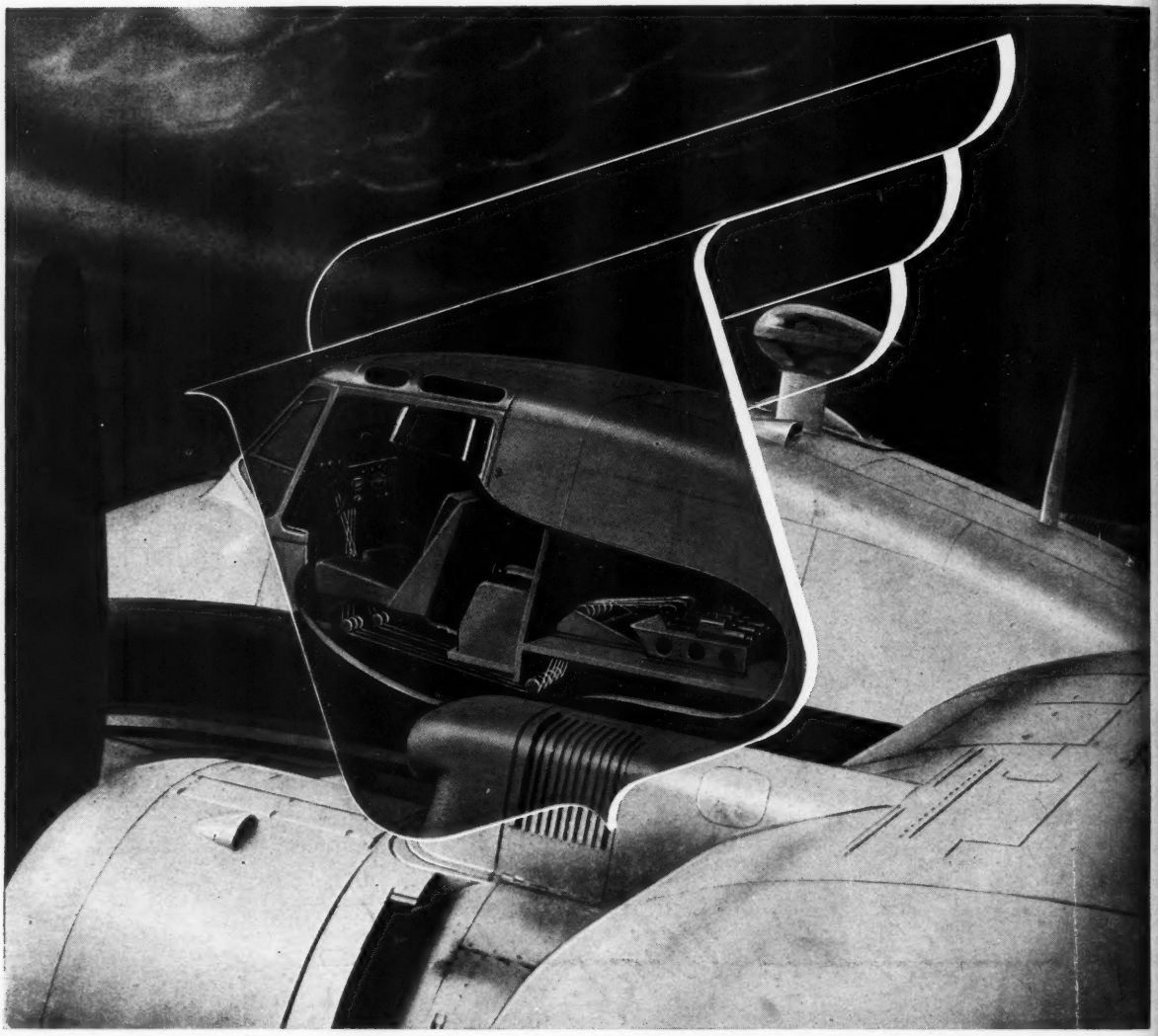

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